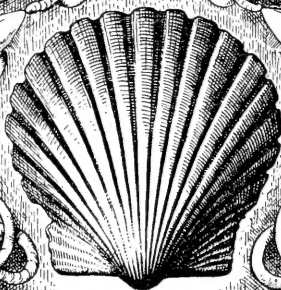


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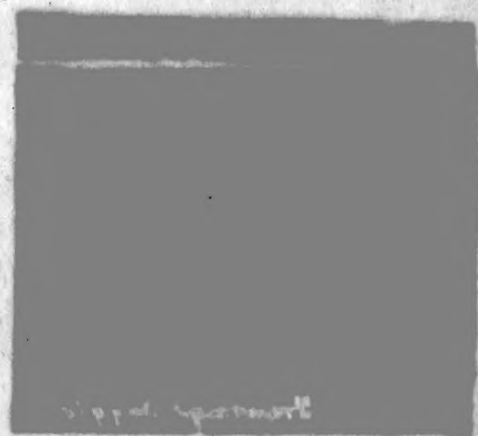
Ex libris

William Healey Dall.



K-2-i BINNEY

Division of Marine
Biology



222 EAST UNION STREET,
BURLINGTON, N. J.

July 26/9

Dear Dr. Dall

My daughter in

Palermo has made the
acquaintance of the Marquis
de Gregorio, who knows all
about me and my books. Is
he known as a Conchologist?

I hope you keep well and
busy on melleusca.

Yrs. truly

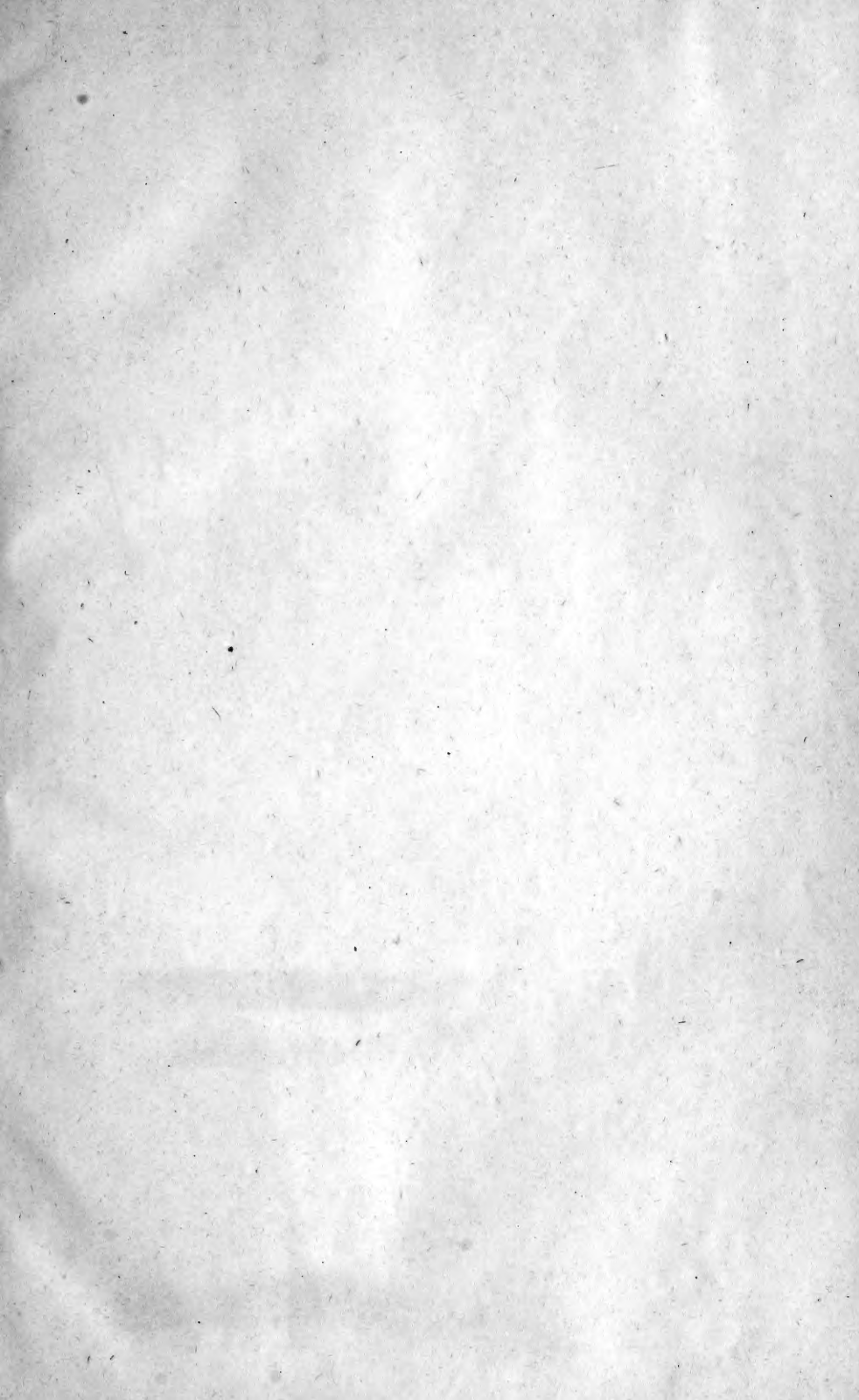
W. G. Binney

BINNEY—At Burlington, N. J., Aug. 3, William
Greene Binney, formerly of Boston, 75 yrs.

Wrote on Natural History Topics

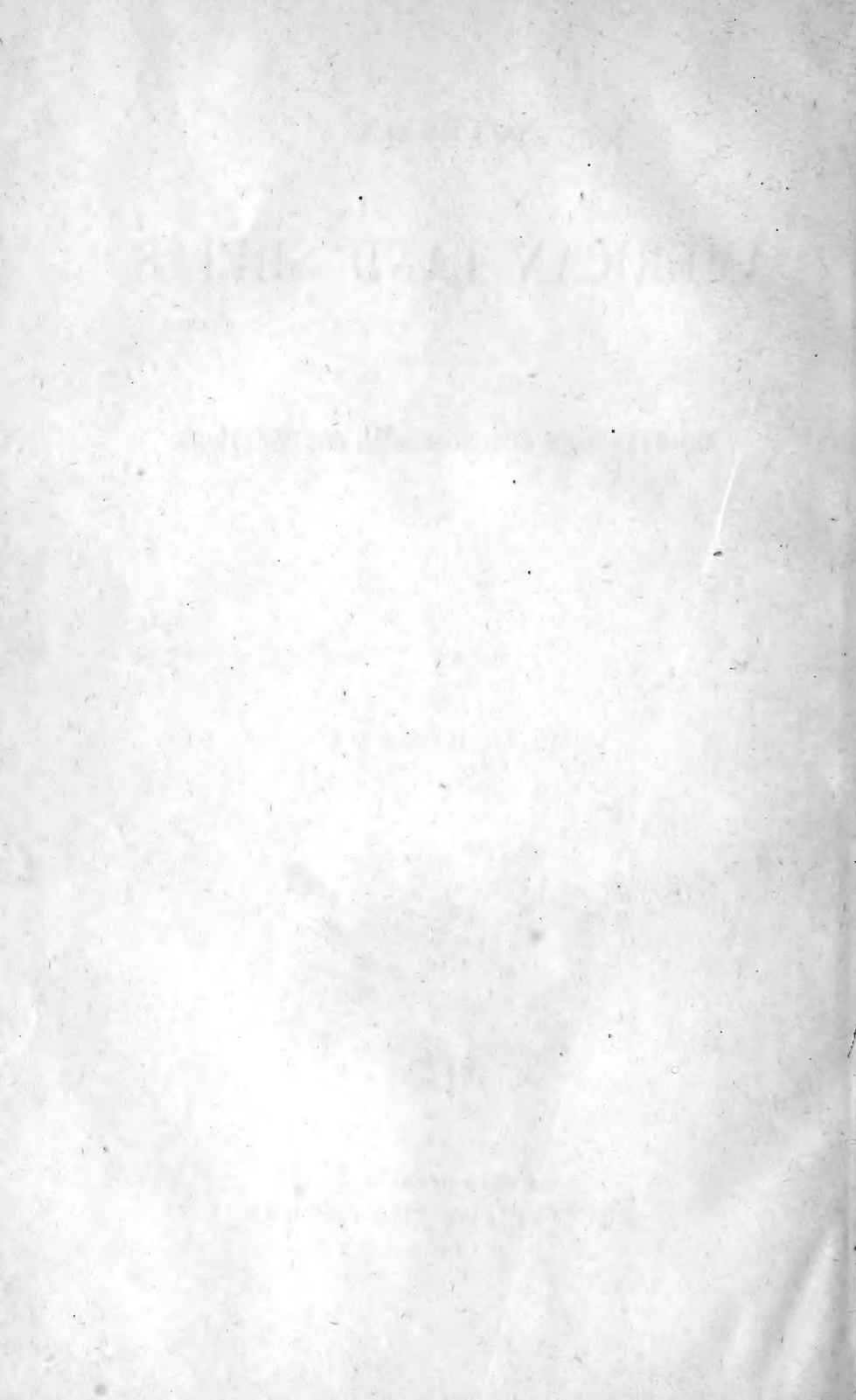
William Green Binney, who was of an old
Boston family, is dead from paralysis at
his home in Burlington, N. J., where he
had resided for many years. He was the
son of Dr. Amos Binney of Boston and as
a young man lived here. He was educated
both in this country and abroad. He be-
came a writer and as such was perhaps
best known as the author of several ar-
ticles on natural history, in which he had
made considerable research. Mr. Binney
served for some years as a director of
several financial institutions. Two daugh-
ters, the Princess di Camporeale of Rome,
and Mrs. Frank Earl of Burlington, N. J.,
survive him.

Transcript Aug 4/9









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NOTES ON

AMERICAN LAND SHELLS,

AND OTHER

MISCELLANEOUS CONCHOLOGICAL CONTRIBUTIONS.

VOL. I. 1856-1874.

Division of Mollusks
Sectional Library

BY
W. G. Binney
W. G. BINNEY.



BURLINGTON, N. J.:
PRINTED FOR THE AUTHOR.
1874.

W. G. Binney

1874

HAVING from time to time distributed among my friends extra copies of my conchological papers, I here offer a title-page and table of contents for the series, which may be bound as Vol. I.

I add a complete list of all the other papers and works which I have published prior to 1874.

W. G. B.

BURLINGTON, N. J., May, 1874.

COLLINS, PRINTER.

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48. Catalogue of the Terrestrial Air-breathing Mollusks of North America, with Notes on their Geographical Range, from Bulletin of Museum of Comparative Zoology, Vol. III., No. 9, 1873, p. 191—220, with a Map (actually distributed in October)	313
✓ 49. On the Lingual Dentition and Anatomy of <i>Achatinella</i> , and other Pulmonata (in connection with Mr. BLAND), from same as No. 47, p. 331—351, plate xv. xvi., 1873 (actually distributed February, 1874)	345
50. Title-page and Table of Contents to Notes, &c., Vol. I.; 1874	i

In addition to the above papers, I have published the following articles, of which extra copies have not been distributed :—

51. Note on *Helix thyroides*, Proc. Boston Soc. Nat. Hist., April, 1857, VI., 128, 129.
52. Descriptions of two supposed new species of American Land Shells, from same, Vol. VI., p. 155, 156, 1857.

53. Note on Geographical Distribution of North American Land Shells, from same, Vol. IX., p. 177, 1863.
54. On Lingual Dentition studied by the Microscope and Photography. From American Journal of Conchology, Vol. V., p. 37, 38, pl. xi., 1869, with a note by Mr. BLAND.
55. Notes sur quelques espèces de mollusques fluviatiles de l'Amérique du Nord. From Journal de Conchologie, Vol. XX. (3d series, Vol. VII.) ; Paris, 1867, p. 427—432.
56. Catalogue of Land Shells, p. 725. From Explorations in Nebraska. Preliminary Report of Lieut. G. K. Warren, Top. Eng., &c. Dr. F. V. Hayden's Report on Geology and Natural History. From Executive Documents, printed by order of the House of Representatives, during the second session of the 35th Congress, 1858—59, Vol. II., Part III., p. 723. Washington, 1859.
57. Report on the Land Shells collected on the Survey, from Reports of Explorations and Surveys to ascertain the most practicable and economical Route from the Mississippi River to the Pacific Ocean, made under the direction of the Secretary of War, in 1854—5, Vol. VI., p. 111—114. Washington, 1857.



I have also published the following works:—

58. The Terrestrial Air-breathing Mollusks of the United States, Vol. IV., pp. 207, and six colored plates, forming also Part I. of Vol. VII. of the Boston Journal of Natural History. Westermann & Co.: New York, 1859.
59. Land and Fresh-water Shells of North America. Part II. Pulmonata Limnophila and Thalassophila, pp. 161, and wood-cuts. From Smithsonian Miscellaneous Collections. Washington, 1865.
60. Part III. of same; Ampullariidæ, Valvatidæ, Viviparidæ, Fresh-water Rissoidæ, Cyclophoridæ, Truncatellidæ, Fresh-water Neritidæ, Helicinidæ, pp. 120, and wood-cuts, 1865.
61. Part I. of same; Pulmonata Geophila (in connection with Mr. BLAND), pp. 316, and wood-cuts, 1869.
62. Report on the Invertebrata of Massachusetts, by A. A. GOULD, M.D. Second edition. Boston, 1870, pp. 524, wood-cuts, and eleven colored plates.
63. The Complete Writings of THOMAS SAY on the Conchology of the United States. New York, H. Baillière, 1858, pp. 252, 74 pl. The "Descriptions of Terrestrial Shells of North America" were published separately in 1856. Philadelphia: Childs & Peterson, pp. 40.

64. The Complete Writings of CONSTANTINE SMALTZ RAFINESQUE, on Recent and Fossil Conchology (in connection with G. W. TRYON, Jr.). New York: Baillière Bros., 1864, pp. 96, wood-cuts, and 3 plates.
65. The Bibliography of North American Conchology, previous to the year 1860. From Smithsonian Miscellaneous Collections. Washington, Part I., pp. 650, 1863.
66. The same, Part II., pp. 298, 1864.



[From the Proceedings of the Academy of Natural Sciences of Philada., February, 1857.]

[18] Descriptions of American Land Shells.

BY W. G. BINNEY.

HELIX INTERCISA. Testa solidissima, luteo-cinerea, apice rufâ, globoso-conica; spira brevis, sutura impressa; anfr. quinque convexiusculi, lineis parallelis, volentibus, valdè demissis, strias incrementales distinctas intercidentibus;

[19]

anfractus ultimus globosus, supra perpheriam fasciâ unicâ, rufâ, obscurissimâ ornatus; apertura maximè obliqua, formâ equicalcei, rotundata; labrum albo-cinereum, incrassatum, subtus reflexiusculum, subunidentum, umbilicum occultans; marginibus approximatis, interjunctis. Diam. maj. 22; min. 19; alt. 15 mill.

Habitat in provinciâ Oregon.

Figurata est sub nomine *H. Nicklinianæ*, Lea, var. tabula vi. patris mihi Amos Binney, Doctoris, (Terrestrial Mollusks, iii. t. vi. fig. 1, icon in medio posita, vol. ii. p. 120). Sed differt ab hac specie et ab *H. Californiense*, Lea, formâ testâ solidiori, aperturâ, et sculpturâ indentæ et granulatæ absentia. Ab aliis Californiæ et Oregon speciebus hodie cognitis, lineis profundis volventibus facile noscitur.

SUCCINEA LINEATA. Testâ oblongo-ovatâ solidiori, albidâ, vel cinereâ; spirâ elevatâ, acutâ, suturâ, impressâ, anfr. ternis convexis, lineis crassis parallelis inter rugas incrementales volventibus ornatâ; aperturâ oviformis, partem testæ dimidiam æquante; columella plicatâ. pariete callo albo indutâ. Diam. 6, alt. 12 mill.

In provinciâ Nebraska, ad flumen 'Yellowstone' prope Fort Union specimina plurima collegit Dr. F. V. Hayden.

Similis *S. vermetæ*, Say, sed formâ magis ovali, aperturâ anfractibus convexis et spira breviori differt. Cognoscitur inter Succineas Americanas testâ solidiori, aperturâ oviformi, et specialiter lineis volventibus in anfr. ultimo positus.

[Feb. 1857.]

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From the Proceedings of the Academy of Natural Sciences, October, 1857.

Notes on American Land Shells. No. 2.

BY W. G. BINNEY.

HELIX (POLYGYRA) ACUTE-DENTATA. Testa superne et subtus parum planata, discoidea, albida, glabra; anfractus 6 lævigati, quorum quinque æqualiter accrescentes, apicem brevissimam, vix elevatam formantes; ultimus permagnus, inflatus, prope peristomata bis valde scrobiculatus, ad aperturam deflectus; subtus anfractus $1\frac{1}{2}$, ultimus ventricosus, alter rapide decrescens; umbilicus parvus, profundus; sutura impressa; apertura parva, perobliqua, ringens; peristoma circulare, acutum, album, incrassatum, patulo-reflexum, marginibus callo albo, dentiformi, emarginato, excavato conjunctis, dextro dentibus duobus horizontalibus, uno obtuso, alteri acutissimo intus armato, basali dente unico perpendiculari in margine posito, munito.

Diam. maj. 14, min. 11, alt. 4 mill.

Specimen unicum in collectione Phillips conservatum in provincia Mexicana Cinaloa ripis fluminis Mazatlan collegit Gambel.

This curious *Helix* differs from any hitherto known. It is readily distinguished by a white, shining, discoidal shell, curious aperture and internal teeth. The upper surface is composed of six whorls, five of which regularly increase from the spire, which is slightly elevated; the last is proportionally very wide, inflated, and elevated above the others, almost to a level with the apex. Below, one full ventricose whorl is visible, and more than half of another, which rapidly decreases until it becomes lost in the small umbilicus. The aperture is oblique, basin-shaped, furnished with four teeth; of these one on the parietal wall connecting the extremities of the peristome is broad, excavated in the middle, angular, resembling that of *H. Troostiana*, Lea, (plicata, Say); on the basal portion of the peristome is another, situated on the edge, perpendicular and short; on the right lip, slightly removed within the aperture, are two slight elongated laminae, running horizontally, the lower one raised above the whorl for some distance, thus forming a slender, spear-like point. Behind the teeth on the outer whorl are two pits, between which the shell is pinched into a sharp ridge joining the peristome.

HELIX (POLYGYRA) LOISA. Testa albedo-cornea, tenuis, supernè minutè et confertim striata, spira paululum elevata, sutura impressa, anfr. quinque, vix convexiusculi, ultimus permagnus; subtus inflata, nitida, vix perforata, anfr. $1\frac{1}{2}$, ultimus ventricosus, prope peristoma bis valde scrobiculatus; alter rapidissimè decrescens, apertura ringens, quinquedentata; perist. acutum, album, incrassatum, patulo-reflexiusculum, marginibus callo albo, crasso, dentiformi,
1857.]

paululum intrante, angulato conjunctis, dextro laminis duobus horizontalibus, curtis, intus positis munito; basali dentibus duobus perpendicularibus in margine positis, uno parvulo, altero majore, munito.

Diam. maj. 13, min. 11, alt. 5 mill.

In Provincia Mexicanâ Cinaloâ ad flumen Mazatlan collegit Gambel. Collect. Phillips.

Var. minor diam. maj. 10, min 7, alt. 3. In Texas habitare dicitur. Collec. Mea.

Shell above depressed, shining, with hardly perceptible striæ, whitish, suture slightly impressed, whorls five, rather convex, last whorl rather proportionally larger, with two pits behind the peristome, and channelled; spire slightly elevated; below smooth and shining, one full ventricose whorl and a portion of a second, which rapidly decreases in the slightly perforated umbilicus; aperture basin-shaped, much complicated by five teeth; one on the parietal wall is white, heavy, angular, somewhat like that of *H. Texasiana*, connecting the the two extremities of the sharp and reflected peristome. On the edge of the peristome near the columella are two short, stout, perpendicular teeth, the nearer one the shorter; within the aperture are two short, slender, tooth-like, horizontal laminæ, entering but a short distance; umbilicus nearly closed; peristome white, thickened, slightly reflected.

Nearest allied to *H. ariadne*, Pf., (*Couchiana*, Lea, Proc. Acad. N. S., anno 1857, April, p. 102.) I have compared it to Mr. Lea's type, and find it to be quite distinct. The latter is not perforated and has a very different arrangement of teeth. That *H. Loisa* is not a less developed specimen of *H. Couchiana* is shown by the fact of its being twice the size. Mr. Lea's shell has the parietal tooth more angular, flexuose, and entering farther into the aperture; the teeth on the right lip are not horizontal, heavier and longer, and extend to the edge of the peristome, where they are very solid and elevated, while in *Loisa* they are slender laminæ, removed within the aperture.

HELIX (POLYGRA) MOOREANA. Testa orbiculato-depressa, carinata, umbilicata, albida; spira obtusa, plus minusve elevata; anfr. 6, vix convexiusculi, striati, ultimus infra carinam non rotundatus; sutura impressa; subtus striæ minus distinctæ; anfr. 1½, ultimus carinâ valde productâ anfr. alterum et umbilicum profundum pene tegens; apertura orbicularis, contracta, tridentata; perist. album, incrassatum, vix reflexiusculum, margine basali dentibus duobus curvatis marginalibus sinu parvulo orbiculari separatis, armato; plica alba rectangularis, dentiformis, excavata, in medio aperturæ projecta ad columellam adnata, et perist. margines connectans.

Diam. maj. 8½, min. 7, alt. 3 mill.

Hab. Washington Co., Texas. Fr. Moore!

Shell orbicular, depressed, white, carinated, umbilicated; spire more or less depressed, obtusely rounded; whorls 6, distinctly striated, hardly convex; suture impressed; below the carina the body whorl is not rounded, but slants down to the base which is parallel with the suture; below, the striæ are less distinct; at the umbilical region only 1½ whorl is visible, the outer one strongly carinated so as to conceal a portion of the umbilicus and a great part of the remaining whorl; the umbilicus is very small, but perforates the shell to the apex, showing all the volutions with the aid of a lens; aperture rounded, contracted by three teeth; lip heavy, broad, white, hardly reflected, near the basal extremity, quite on the edge, armed with two short, incurving teeth, separated by a small rounded sinus; on the columella there is a tooth-like fold, square, projecting across the aperture, its extremities joining those of the peristome.

It is difficult to express correctly in words the specific differences of the various *Polygyræ*. This shell combines the characteristics of several American species. It has the spire of *H. monodon*, Rackett, and the columellar fold of *Dorfewilleana*, Lea, as figured Tr. Am. Phil. Soc. vi., pl. xxiv., f. 118. The teeth are placed on the inner edge of the peristome, as in *Texasiana*, Mor., and the curious carination at the umbilical region resembles that of *pustula*, Fer.,

[October,

which has not been noticed in descriptions. In the collection of the Academy.

HELIX CULTELLATUS, Thomson, MSS. Testa orbiculato-depressa, nitens, carinata, corneo-rufescens, ad peripheriam et ad suturas albo-zonata; anfr. $6\frac{1}{2}$ convexiusculi, striis minutis incrementalibus et lineis microscopicis spiralibus decussati; sutura impressa, apertura oblique lunaris; perist. simplex, acutum. ad columellam vix reflexiusculum; subtus lævigata, albida, infra carinam latè rufo-corneo-zonata; umbilicus perspectivus, anfr. omnes ad apicem monstrans. Diam. maj. 35, min. 19, alt. 13 mill.

Habitat. "Contra Costa Co., California." J. H. Thomson.

Animal twice the length of the diameter of the shell; color reddish.

Mr. J. H. Thompson, of New Bedford, Mass., proposes this name for a shell found by him living in considerable quantities. The circumstances in which it was discovered are very unfavorable to the supposition of its having been brought from abroad. The chances of a Dalmatian shell having been introduced into California, and already multiplying there, are very small indeed. At the same time the shell before me bears strong resemblance to the European group of this type. It seems to be between *H. albanica*, Ziegler, and *acies*, Partsch; the carina being less sharp than in the latter. Mr. Thomson suggests that it may have been imported from the Sandwich Islands on vegetables, but there is no species native to that region which bear any resemblance to this.

HELIX ANACHORETA. T. orbiculato-convexa, apertè umbilicata, cinereo-rufescens, granulata et rarè indenta; spira elevata, conica; anf. 6 convexi, ultimus subtus ventricosus; sutura impressa; perist. incrassatum, vix reflexiusculum, violaceo-albidum, umbilicum haud multum occultans, marginibus approximatis, callo conjunctis; faux violacea; apertura obliqua, transverso-rotundata. Diam. maj. 26; min. 21: alt. 14 mill.

Habitat omniam Californian. J. H. Thomson.

Shell reddish ashen, orbicularly convex; spire elevated, conic; umbilicus open, slightly concealed by the peristome; whorls six, granulated and sparsely indented; suture impressed; below ventricose; aperture transversely rounded; peristome thickened, scarcely reflected, whitish, with a violet tinge, the extremities approaching each other and connected with a callous on the parietal wall; throat violet.

"Animal light ashen color, tentacles nearly white; average length of some thirty specimens $2\frac{1}{2}$ inches (2 diameters of shell); superior tentacles 5-8ths; inferior 3-16ths inch; foot broad at the posterior extremity; a line of large granules down the middle of the back; sides of foot margined with a line of light granules (pores); genital orifice posterior to and beneath the larger tentacles. In its habits solitary." Thomson.

It is with some hesitation that I propose a name for this shell. I at first considered it as a bandless variety of *Californiensis*, Lea. But on expressing this opinion to Mr. Thompson, he gave me the above description of the animal and its habits, which are quite distinct from those of Mr. Lea's shell. Its characteristics were found constant at various remote points of the State, and in a considerable number of specimens. They seem too great for a simple variety. The animal is also different in its habits from *Californiensis*, being found only solitary, while the latter is gregarious.

The shell is one of the very few bandless species of California.

HELIX ÆRUGINOSA, Gould. (Proc. Boston Soc. N. H., Feb., 1855, p. 137.) Nomen transmutandum est ob. *H. æruginosam*, Pf. (Pro. Zool. Soc., London, 1854.) This name being preoccupied for a Philippine Island shell, Dr. Gould proposes to call it *H. ARROSA*. "Inhabits only Redwoods." (Thompson). It seems a very variable shell. The type resembles in shape *H. Townsendiana*, Lea. Among the land shells collected in California by Dr. J. S. Newberry, P. R. R. Survey, was one which I called var. β of Dr. Gould's shell. It has a very elevated, conical spire, like *elevata*, Say, but agrees in other respects with the 1857.]

type. The Californian land shells seem very difficult to understand on account of their variation. Although this shell bears little resemblance to *Californiensis*, Lea, as fig. in Tr. Am. Ph. Soc., vi., pl. xxiii., f. 19, there is a gradual blending of the two. For some of the links in the connecting chain, see the fig. Terr. Moll. iii, vi. a, Reeve, Con. Icon. 661, and Chemn. Ed. 2, pl. lvii. fig. 14, 15. The last resembles *arrosa*, var. β very much. This connecting chain of resemblance is also carried by specimens in my cabinet to *Dupetithuarsi*, Desh. Future research will alone enable us to draw the correct divisions of the species.

HELIX (POLYGYRA) THOLUS. Testa solidiuscula, albida, nitens, costis obliquis notata; spira rotundata, elevatiuscula, obtusa, tholiformis; sutura valde impressa, anfr. 7, convexiusculi, superi magis planulati, ultimus ad aperturam descendens, obtusè carinatus, carina peristoma non attingens, post perist. canaliculatus; infra carinam costæ minus distinctæ; basis plana, umbilicus latus, perspectivus, anfractus canaliculatos monstrans, quorum 2½ perspicuè alii obscurè videntur; apertura perobliqua, ab axe remota; perist. album, semicirculare, latum, incrassatum, margine basali reflexiusculo, dentibus duobus sinu rotundato disjunctis armatum; plica parietalis acuta, in medio aperturæ projecta, margines peristomatis vix connectens. Diam. maj. 11; min. 9; alt. 4 mill.

Habitate in Texas suspicor, sed incertus sum. Specimen unicum vidi in coll. Bland conservatum.

Shell rather solid, white, shining, ribbed above, smoother below; spire obtuse, little elevated, rounded; whorls seven, convex, the upper ones more flattened, the last bluntly carinated; carina not reaching the peristome; base parallel to the suture; umbilicus broad, half the larger diameter of the shell, showing two and a half deeply grooved whorls plainly, the others rapidly retreating towards the apex; aperture very oblique, semicircular, removed from the axis of the shell, bordered with a scarcely reflected, white, heavy rim, grooved behind, and armed with two stout teeth near the basal extremity, broadly reflected at the junction with the body whorl; on the parietal wall of the aperture is a white fold, hardly connecting the extremities of the lip, and projecting across the aperture into an acute point.

The aperture of this curious shell resembles that of *H. fatigiata*, Say. It is readily distinguished from that and all other described species by the umbilicus, broad at the commencement, and rapidly narrowing beyond the second whorl, with the peculiar groove visible in all the whorls of the umbilicus, of the same character as that noticed by Say in *auriculata*, though deeper.

The name is derived from the resemblance of the slightly raised, rounded spire to a low dome.

HELIX KOPNODES. Testa depresso-globosa, corrugata, subtus lævigata; spira brevis, depressa; sutura mediocris; anfr. quinque, rapidè accrescentes, ultimus permagnus, ventricosus, interdum lineis volventibus crassis notata; apertura magna, rotundata; perist. simplex, acutum, marginibus approximatis, callo levi, brunneo conjunctis; ad umbilicum parvum et profundum reflexiusculum. Diam. maj. 35; min. 28; alt. 13 mill.

Habitat in Alabama, (C. S. Hale!)

Forsan forma monstrosa *H. fuliginosa*, Binney, sed differt specimipibus meridionalibus colore, testâ majori, solidiori, magis globosâ; umbilico angustiori; aperturâ majori, magis rotundatâ, spira magis elevatâ; et lineis volventibus. Varietates alligantes non exstant.

Figura Reeveana, Con. Icon. No. 672. Etsi minus globosa, affinis paritur sed minutè costellato-striata dicitur.

Shell depressed-globose, wrinkled, below smooth; spire short, depressed; suture moderate; whorls five, rapidly increasing, the last very ventricose and large, sometimes marked with coarse revolving lines; aperture large, round, lip simple, acute, ends approached, joined by a slight deposition of brownish callus over the parietal wall, reflected at the small and deep umbilicus.

It is a much larger and more globose shell than *H. fuliginosa*, Binney, with a

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smaller umbilicus, more rounded and larger aperture, and more ventricose body whorl; its color is also lighter. The revolving lines are present in four out of six specimens before me.

Reeve's fig. Con. Icon, No. 672, has some resemblance to it in shape, though less globose—but differs in being striate above.

In the collection of the Academy.

HELIX FRIABILIS. Testa globosa, papyracea, friabilis, subdiaphana, nitens. rufescens; spirā parvula, elevato-conica; anfr. quatuor, læviter corrugati, convexi, ultimus permagnus, ventricosissimus; sutura mediocris; apertura circularis, parum alta et longa, intus livida, callo levi albo sub-incrassata; perist. acutum, tenue, simplex, ad basin reflexiusculum, violaceum, umbilicum parvum et profundum aliquantum tegens. Diam. maj. 26; min. 20; alt. 13 mill.

Habitat in ripis fluminis Wabash, (Mrs. Say!) In Illinois (R. Kennicott!)

Species rara, ad sectionem *H. fuliginosa*, Binney, referenda, sed testā papyraceā et rotundatā, spirā elevatā, et aperturā circulari distincta.

Shell very globose, transparent, brittle, thin, shining, reddish; spire very short, conic; whorls four, convex, lightly wrinkled, rapidly increasing, the last very large and ventricose; suture moderate; aperture circular, equally high and broad, within bluish and slightly thickened by a very thin white callus; perist. simple, sharp, thin, at its junction with the body whorl, violet colored and reflected, so as to cover a portion of the small and deep umbilicus; the parietal wall of the aperture is covered with a light violet colored callus.

Belongs to the same group as *H. fuliginosa*, Binney—but readily distinguished from that and all described species by its transparent, globular shell, ventricose body-whorl, and circular aperture. At the localities where it was found by Mr. Kennicott, *H. fuliginosa* was not noticed.

There is a shell received from Texas, by Dr. Newcomb, which may prove to be identical with this.

In the collection of the Academy.

HELIX REDIMITA. Testa globoso-conica imperforata, tenuiscula, minutē et confertim granulata, corrugata, rufo-brunnea; apex lævigata, obtusula, spirā elevata; anfr. 6 convexi, suturā impressā distincti, ultimus permagnus, inflatus, ad aperturam descendens, supra medium fasciā fuscā redimitus; apertura perobliqua, transverso-orbicularis, intus unifasciata; perist. simplex, rufocine-reum, incrassatum, marginibus valde approximatis, basali reflexiusculo, callo albo umbilicum tegente. Diam. maj. 21; min. 17; alt. 12 mill.

Syn. *Helix Nickliniana*, Binney, Terr. Moll. iii. pl. vi, f. 1, exceptā icone in medio positā.

Habitat in California aut in Oregon?

Shell globose-conic, imperforate, rather thin, wrinkled, covered with minute and crowded granulations; color reddish brown; apex free from granules, rather blunt; spire elevated; suture impressed; whorls six, convex, the last quite large and rounded, falling towards the aperture, and banded with reddish brown above the middle; aperture rather large in proportion to the size of the shell, very oblique, transversely rounded, within showing the band; peristome simple, reddish ash color, thickened, reflected slightly at the base, ends approached; umbilicus entirely covered with a white callus.

This shell is figured by my father as a var. of *H. Nickliniana*, Lea. A reference to Mr. Lea's figure and description will at once show it to be distinct, according to the present notions of specific weight. Dr. Gould refers it (Terr. Moll. iii. p. 26) to *H. Californiensis*; Reeve, Con. Icon. 661. It appears, however, to be distinct from the shell there figured.

In general outline it resembles *H. Kellettii*, Forbes, Proc. Zool. Soc., London, 1850, pl. ix, f. 2, as well as Reeve's fig. 665 b, not 665 a, Con. Icon. The resemblance will be found, however, to cease with the outline, on a comparison of the two shells. *H. Kellettii* is sometimes perforate, is differently colored, and belongs rather to the group of California *Helices* represented by *H. arcolata*. 1857.]

Sowb. and H. *Pandora*, Forbes, than that of H. *Californiensis*, Lea, *intercisa*, nob. and the shell before me.

HELIX DUPETITHOUARSI, Desh. In the collection of the Smithsonian Institute there are specimens of this shell which are furnished with a delicate greenish yellow epidermis. As this has never been noticed in descriptions, I believe it must exist only on very fresh specimens, which are rarely seen. On being immersed some minutes in water, the epidermis becomes of a bright golden color.

HELIX LABIOSA. Gould, (by many considered identical with *Columbiana*, Lea.) To Mr. J. H. Thomson I am also indebted for the following interesting notes on this shell. It will be very important to dissect the animal, as it may prove generically distinct from *Helix*.

"Animal twice as long as the breadth of the shell, dark slate color, almost black on the head and tentacles; a black line running along each side of the back from the base of the longer tentacles; body covered with compressed granules; tentacles black, acutely pointed: *eyes at the base of superior tentacles*; anatomy believed to resemble, somewhat, that of the *Lymniadæ*. Gregarious; in its habits resembling *Lymnæa*, being found always near water, and laying its eggs on the water-cresses and other aquatic plants. Arrives at maturity in one year, one half the time required by the other species."

HELIX CALIFORNIENSIS, Lea. "Animal reddish grey, tentacles and base of foot bluish; quite narrow in proportion to the length of the shell; tentacles short. Gregarious, inhabiting dry gullies and hill sides; many specimens found in a cabbage garden." Thomson.

HELIX SPORTELLA, Gould. I am indebted to Mr. Thomson for a fine specimen of this rare species, the only one I have ever seen. His notes show the animal to be quite distinct from that of H. *concava*, Say, however similar the shells may be, with the exception of the striæ on the Californian species. He writes, "Animal uniformly white or flesh colored, with an orange line on top of back. Solitary—or only found in pairs."

HELIX LORICATA, Gould. (*Lecontii*, Lea.) This rare species also was added to my collection through the liberality of Mr. Thomson. One specimen found by him was very much larger than Dr. Gould's shell. He gives the following description of the animal: "white, linear, rough, posteriorly acute, tentacles very short."

BULIMUS DORMANI, n. s. Testa perforata, ovato-turrita, lævigata, albida, fasciis fuscis longitudinalibus ornata; sutura impressa; spira elongato-conica; acuta; apex punctulata; anfr. 6 convexiusculitis, lineis minutissimis volventibus ornati, superi striati, ultimus inflatus, ad marginem superam peristomatis, obtusissimè carinatus; apertura ovata, partem testæ dimidiam subæquans; perist. simplex, acutum, margine columellari reflexiusculum, perforationem pene occultans. Diam. 12; long. 29 mill.

Habitat in peninsula Florida prope St. Augustine. O. S. Dorman!

Shell perforated, rather heavy, shining, elongated-conic; white, with several regular revolving series of interrupted perpendicular, reddish brown patches; suture distinctly marked; apex punctured; whorls 6, rather convex, marked with numerous very fine revolving lines; upper whorls striate; last whorl full, with a hardly perceptible obtuse carina at the upper extremity of the peristome.

The only described species with which this shell can be confounded is B. *Floridianus*, Pf., Proc. Zool. Soc., London, 1855, p. 330. Though I have never seen Dr. Peiffer's shell, I should consider it nearly allied, though distinct. It wants the minute revolving lines, the punctured apex, and striate upper whorls, which characterize B. *Dormani*, is a smaller shell, and has a different marking, being furnished with opaque whitish blotches as well as reddish patches; the latter also do not extend to the body whorl.

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GLANDINA CORNEOLA. Testa conico-oblonga, tenuis, nitens, cornea; anfr. 7 ad 8, convexi, tenuissimè et longitudinaliter striati, et lineis minutis creberrimis notati; sutura crenulata; apertura oblonga, partem testæ dimidiam æquans; columella contorta, truncata, callo induta. Diam. 18; long. 50 mill.

Syn. *Glandina truncata*, var. Binney non Gmel. Terr. Moll. iii. pl. lxi. f. 1.

Habitat in Rebuspublicis meridianis. Florida?

Shell oblong-conic, thin, shining, horn color; whorls 7 to 8, longitudinally striate, and covered with numerous minute revolving lines; suture slightly crenulated; aperture oblong, half as long as the shell; columella curved, truncated, covered with light callus.

This shell, very rare in collections, is distinguished by its light horn color, thin shell and revolving lines.

GLANDINA PARALLELA. Testa solida, albida, nitens, cylindræco-elongata, striis creberrimis longitudinalibus notata; spira elevato-obtusa; anfr. 5 ad 6, superi convexi, ultimus lateribus rectis, æquis intervallis inter se distantibus, apertura angusta, partem testæ 3-7 æquans; labrum flexuosum, in medio rectum, margine basali curvatum; columella recta, truncata, callo induta. Diam. 20; long. 56 mill.

Syn. *Glandina truncata*, var., Binney. Terr. Moll. iii. pl. lxii. f. 2.

Habitat in Louisiana, Rev. E. R. Beadle!

Shell heavy, shining, white, elongated, cylindrical; spire elevated, obtuse; whorls 6 to 7, with numerous, delicate, longitudinal striæ, the upper ones convex, the last one with straight parallel sides; lip straight along the middle, and parallel to the rectilinear side of the opposite whorl, at the basal extremity curved; columella straight, truncated, covered with a heavy callus.

Distinguished by its peculiar parallel sides and heavy texture from any other described species.

The following are notes on the plates contained in Vol. iii. of the Terrestrial Mollusks.

HELIX RUGELI, Shuttleworth, (Diag. neuer Moll. No. 2,) is described as always larger than *H. infecta*, Say. I have the latter of the same dimensions as given for Rugeli, 13 mill., and some specimens of Mr. Shuttleworth's shell only 8 mill.

HELIX MORDAX, Shuttleworth, is a variety of *H. alternata*, Say. I have a large series, showing a gradual change from the typical Northern Shell to the strongly ribbed and more or less carinated Southern form. *H. strongolydes*, Pfeiffer, is also a variety of the same shell. Perhaps, also, *H. infecta*, Parr.

HELIX MULTILINEATA, Say. I have a variety of this with an open umbilicus. Another, received from Mr. J. A. Lapham, of Wisconsin, is small, of an uniform brownish-red, without any revolving lines.

HELIX CLAUSA, Say. Terrestrial Mollusks, pl. iv. The outline figures do not represent this species.

H. VINCTA, Val., Terr. Moll. iii. pl. vi., is certainly distinct from Californiensis, Lea. (Compare his fig. and descr. T. Am. Ph. Soc. vi. pl. xxiii., f. 79.)

The centre figure of this plate is *H. intercisa*, nob. Proc. A. N. S. Phila., 1857, p. 18. Fig. 1. Upper and lower figure cannot be considered a variety of Nickliniana. I propose for it the name of *redimita*.

Pl. vi. a. The European conchologists now consider *H. Nickliniana* and Californiensis as identical, and figure this shell under the latter name.

H. DENTIFERA is not confined to Vermont. It is a mountain shell, has been found by Mr. Edwards in Virginia, Dr. S. E. Shurtleff in Western Pennsylvania, Mr. Conrad at Broad Top Mountain, and Mr. Phillips on the Lehigh.

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H. NUTTALLIANA, Lea, is universally considered as *H. fidelis*, Gray. Mr. Gray's description has the priority of several years.

H. VANCOUVERENSIS, Lea. I see no reason why *H. vellicata*, Forbes, should not be considered as a variety of this.

H. EGNA, Gould non Say, pl. xxii. a. This shell, though never seen by Mr. Say, is called by one of his names. It is certainly a disadvantage to increase the already burthensome nomenclature, but is it not worse to make one name serve for two distinct species? Mr. Say's shell was found by Mr. J. S. Phillips at the 8 mile lane above Philadelphia, and is still preserved in his collection. I think it will prove to be distinct from *chersina*, Say. The latter has a much more elevated spire, rounded at the top like *labyrinthica*, Say, and is only obtusely carinated; while in *egna*, Say, a very acute carina divides the shell into a short, pyramidal, sharp spire, and a rounded, inflated base, whose outline forms a semicircle. As I consider *H. egna* a good species, I leave it to Dr. Gould to propose another name for the Florida shell.

HELI *FALLAX*, Say, is certainly more than a variety of *tridentata*, Say. Not only are the characteristic differences well marked, but the habits of the respective animals are different. Mr. J. G. Anthony tells me that *tridentata* is found on hill sides in the grass, while *fallax* inhabits rich soils, in woods, under logs, and is not gregarious like the former. The difficulty is to mark the dividing line between the many varieties of *fallax*, some of which are quite as distinct as *H. Hopetonensis*, Shuttl. In one specimen of *fallax* in my cabinet there is a well developed "fulcrum" as in *monodon*, *spinosa*, and others mentioned by Mr. Lea.

HELI *MINUTISSIMA*, Lea, is certainly distinct from *H. minuscule*, Binney. Had my father been pressed to finish his work, he would have withdrawn the opinion expressed in Vol. ii., p. 221. I have a note of his taken at Mr. Lea's house, in which he says they are distinct. Dr. Leidy tells me that he made a figure of Lea's type for engraving, which was subsequently lost.

HELI *COSTATA*, Müll. Dr. F. V. Hayden collected many thousands of this ribbed variety of *pulchella*, Müll. (*minuta*, Say,) in Nebraska. It had hitherto been noticed only in Philadelphia and Cincinnati.

HELI *GLAPHYRA*, Say, pl. xxix., f. 4. That this shell is identical with *cellaria*, Müll., was the opinion of Dr. Binney. I am able to add to the same effect the testimony of two of our first conchologists, Mr. J. G. Anthony and Dr. Griffith. The former tells me that thirty years ago he found a shell in considerable numbers in his garden, at Providence, R. I., in all respects agreeing with the European *cellaria*. On carrying it to Philadelphia, the conchologists of that time all called it *glaphyra*, Say. The testimony of Dr. Griffith is still more conclusive. I have a letter of his to my father in which he says that he had seen Say's type of *glaphyra* in the collection of the Academy, and that it was certainly the *cellaria* of Europe. He adds, that when arranging the collection, the shell was broken and thrown aside.

HELI *SAXICOLA*, Binney non Pf. pl. xxix. a. f. 4, is *H. incrustata*, Poey. It agrees in all respects with the Cuban specimens in the Academy received from Mr. Poey.

HELI *LUCUBRATA*, Binney non Say, pl. xxxii. does not represent Say's shell. Though figured by Deshayes in Fer. Hist. pl. lxxxii. f. 6, it was first described by Pfeiffer, Mong. i, p. 64. The common form is hardly as globose as the shell figured.

HELI *SULPLANA*, Binney, has been found by Mr. J. S. Phillips on the banks of the Susquehanna, near Wyoming, Pa.

HELI *INTERTEXTA*, Binney, pl. xxxvi. The southern form of this shell would by many be hardly considered as the same species. The spire is very much

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flattened, color much lighter, body whorl less inflated and very sharply carinated. The northern form very rarely reaches the size figured.

HELIX SEPTEMVOLVA, Say, pl. xxxviii. The middle figures come nearest to Muhlfeldt's type of *cereolus*, figured in the Berlin Magazine. The internal lamina mentioned on page 31 is found constantly in *H. microdonta*, Desh. of Florida. It is not, however, confined to that alone, (Shuttl. Diag. Neuer Moll. No. 2,) as I have detected it in a few instances in the large *cereolus* and other forms. In Florida there are several varieties of this shell as well worthy of specific distinction as *microdonta*, Desh., *volvoxis*, Parr, and *delitescens*, Shuttl. Muhlfeldt's name *cereolus* has priority, having been published in 1816, and not 1818 as quoted by Pfeiffer, &c. The European conchologists, Pfeiffer, Reeve, &c., mention as a synonym of this shell *H. polygyrata*, Binney, a name not even mentioned by him.

HELIX SUPPRESSA, Say, small var. Pl. xxxvii. fig. 3. This appears to be *bicostata*, Pf.

HELIX PLICATA, Say, pl. xxxix. f. 2. Mr. Say's type is preserved in the collection of the Academy. Having carefully compared it with Mr. Lea's original *Troostiana*, I am led to believe them identical. In this case Mr. Lea's name alone will stand, as that of Mr. Say is preoccupied. In Vol. ii. p. 195, *H. plicata* is said to be identical with *fatigiata*, Say, *Dorfeuilleana*, Lea, and *Troostiana*, Lea. I cannot agree with this opinion; *H. fatigiata* is certainly distinct from the others. (Pl. xxxix. f. 2.) The characters on which Mr. Lea's two species are founded are certainly not very distinct; at the same time their constancy gives them weight. Of twenty-five specimens found in Tennessee by the Rt. Rev. Bishop Elliott, all were well marked *H. Troostiana*.

HELIX LEPORINA, Gould, had been found only in Mississippi and Arkansas, until Mr. Postel discovered it at St. Simon's Isle, Georgia, Dr. H. M. Neisler in Butler County, of the same State, and Bishop Elliott at Savannah. Future research will probably prove it an inhabitant of the whole South.

HELIX MAXILLATA, Gould, has also been found by Dr. H. M. Neisler in Butler County, Georgia.

HELIX BUFFONIANA, Pf., pl. xliii. This seems rather the variety which Pfeiffer described formerly as distinct under the name of *Humboldtiana*; he now unites the two.

HELIX INFLECTA, Say, pl. xlv. f. 3. It is a typographical error on p. 33 to call this *H. triodonta*, Jahn.

HELIX POLYCHROA, Binney, pl. xlvi. xlvii. It is hardly necessary to find another name for this shell (ob. *H. polychroam*, Sowb.) as it seems to be *varians*, Mke.

HELIX SELENINA, Gould, pl. xlviii. This is certainly *H. vortex*, Pf., of the West Indies. I do not agree with Dr. Gould, (p. 34,) in considering *H. tenuistriata*, Binney, as the same shell; a comparison of the description of the latter will show them to be distinct. The geographical distribution is also very different. Dr. Binney's shell is from Tennessee, while *vortex*, is a West Indian species, introduced only into the Southern extremity of Florida. The description on the cover, Boston Journal Nat. Hist. iv. part 1, anno 1842, is as follows. "*Helix tenuistriata*. Testa depressa, carinata, umbilicata, albido cornea; anfr. 7 oblique striatis; apertura angusta, depressa, labro subreflexo, basi convexo. Lat. $\frac{3}{4}$ poll. Hab. Tennessee." I have a shell in my cabinet to which this description applies pretty well; I am not sure, however, that it is the same. Future research will undoubtedly bring the species to light.

HELIX AURICULATA, Say, pl. xl. I do not consider fig. 2, *H. avara*, Say, as a var. of this, but a distinct species. There are some varieties of *auriculata*, which may be confounded with it, but it is certainly a good species. Among other 1857.]

distinctive characteristics it is *hirsute*, as mentioned by Say. I am indebted to Mr. James Postel, of St. Simon's Isle, Georgia, for some very fine fresh *hirsute* specimens. From Mr. O. S. Dorman of St. Augustine, Fla., I have some fine specimens of *auriculata*, 16 mill. in the greatest diameter.

HELIX ELEVATA, Say. Mr. Robert Kennicott collected in Wisconsin two specimens of a curious variety of this species, furnished with a broad, revolving, brownish band on the body whorl.

HELIX STENOTREMA, Fer. pl. xlii. f. 4, is a very well marked variety of *hirsuta*, confined to the region of Tennessee.

BULIMUS DEALBATUS, Say, pl. li. However well defined may be the distinctive characteristics of this species and *B. schiedeanus*, *lactarius*, &c., it is extremely difficult to trace the dividing line between them, when seen in large quantities. I have specimens picked from the same bush in Texas, some of which would be referred to each of these species. At the same time it seems hardly possible that the large, heavy shell figured on pl. li. *b*, should be the same species as the small, fragile shell pl. li., fig. 1. At all events, it is necessary to distinguish them by different names.

ACHATINA PELLUCIDA, Pf. pl. liii. f. 2, is *Blauneria (Voluta) heteroclita*, Mont. Dr. E. Foreman has specimens found in his garden at Washington, whither they were brought on plants from Charleston, S. C. Mr. T. Bland found it inhabiting brackish water in Jamaica.

BULIMUS VIRGULATUS, Binney non Fer. pl. lviii., (see remarks Vol. ii. p. 279.) I concur entirely with Dr. Gould in considering this shell identical with *B. multilineatus*, Say, which name has the priority of many years of Reeve's name *venosus*. Ferussac's shell is quite distinct. Mr. Say's description of *B. multilineatus*, (Journ. Acad. N. S., Phila., Vol. 5, p. 120, anno 1825,) is as follows: "Shell conic, not very obviously wrinkled; whorls not very convex, yellowish white, with transverse, entire, reddish brown lines; a blackish subsutural revolving line; apex blackish; umbilicus small, surrounded by a broad blackish line; columella whitish, labrum simple, blackish. Length less than 7-10th inch, greatest breadth less than 7-20th inch. This species was found by Mr. Titian Peale on the southern part of East Florida."

Mr. Bartlett found the *virgatus*, Binney, in the same locality.

GLANDINA TRUNCATA, Binney non Gmel., pl. lxi. f. 1, is *G. corneola*, nob. vid. supra. Fig. 2 is *G. Texasiana*, Pf., *Novitates Conch.* p. 7, pl. xxii. f. 11, 12. Figure 2, pl. lxii. is *G. parallela*, nob. vid. supra.

HELICINA ORBICULATA, Binney non Say, Pl. lxxiii. last line, middle figure, is *Hel. tropica*, Jahn.

HELICINA CHRYSOCHEILA, Binney, pl. lxxiv. f. 4. I have specimens of this shell in my cabinet, and consider it distinct from *Hel. Jamaicensis*, Sowb., and all other described species. I have a note taken by my father at the collection of M. Petit de la Saussaye in Paris, in which he says that a similar shell is labelled from Tampico. Compare *Hel. turbinata*, Wieg., Ch. ed. 2, pl. iv. f. 13, 14, 15.

Notes on American Land-Shells, deposited by Mr. Say, and still preserved in the collection of the Academy.

HELIX LUCUBRATA, Say. I have lately found among the shells of the Academy my three specimens of a shell labelled many years ago, "*Helix lucubrata*, Say—Mexico." I have made a very critical comparison of them with authentic specimens of *H. caduca*, Pf., received through the kindness of Mr. Cuming. I am now confirmed in the opinion I expressed before, that the two shells are undoubtedly identical. The resemblance of these Mexican shells to *H. fuliginosa*, Binney, is strong enough to have given Dr. Griffith the impression that they were the

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same. He expressed himself to that effect in letters to my father. From Dr. Griffith, Prof. Adams may have received the same impression (see Vt. Moll.) I am inclined to differ from them, believing the species, though nearly allied, to be quite distinct. Until we receive the true *H. fuliginosa* from the South-western States, I shall doubt its existence there. Our country has been too little searched, however, to allow us to draw very nicely the lines of geographical distribution. If I am correct in my view of this species, Mr. Say's name will, of course, take precedence over that of Dr. Pfeiffer.

HELIX CLAUSA. The specimens are much more globose than that figured in Am. Conch. The aperture is quite orbicular.

HELIX APPRESSA, HIRSUTA, INFLECTA, PROFUNDA, AURICULATA, LIGERA, SOLITARIA; SUPPRESSA.

H. FATIGIATA, as fig. in Terr. Moll. iii. pl. xxxix, f. 4.

H. PLICATA. Like *Troostiana*, Lea.

H. FALLAX. The upper denticle on the peristome placed within the aperture, like that of *H. vultuosa*, Gould.

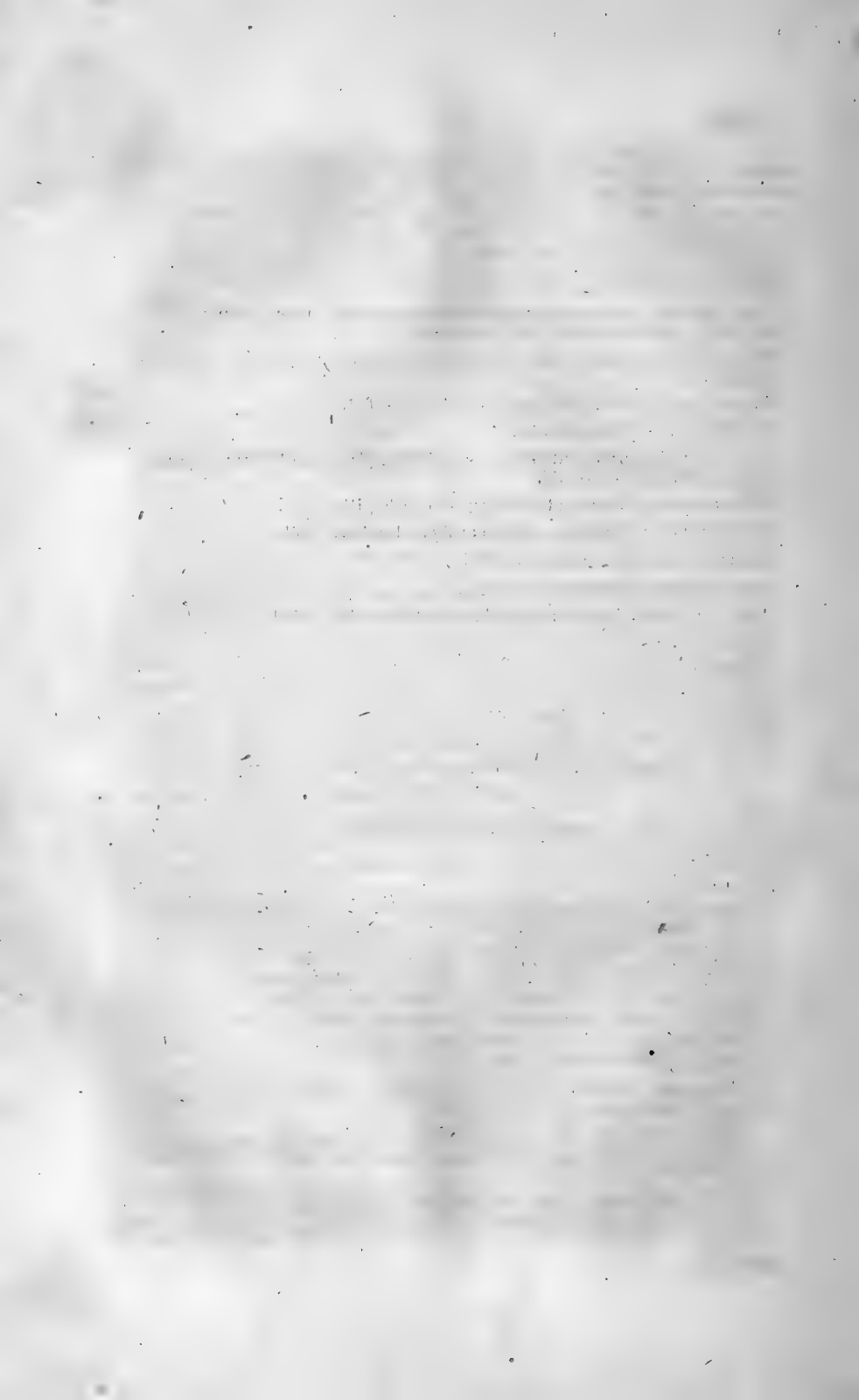
H. SEPTENVOLVA. Large and small var. of *cereolus*, Mhtl.

SUCCINEA AVARA, CAMPESTRIS. Same as figured in Terr. Moll.

HELICINA ORBICULATA, OCCULTA, (fossil.)

PUPA PENTODON, CORTICARIA, ARMIGERA.

ACHATINA SOLIDA. More elongated than that fig. in Terr. Moll.



From the Proceedings of the Academy of Natural Sciences, May, 1858.

Notes on American Land Shells. No. 3.

BY W. G. BINNEY.

The following species of *Helicidæ*, now first described, were collected by Dr. F. V. Hayden, of the Yellowstone Ex. Ex., (Lieut. G. K. Warren), Dr. T. S. Newberry, of the Colorado R. Ex. Ex., (Lieut. Ives), Mr. Robert Kenicott, during a recent visit to the Red River of the North, and in Mexico by the late Mr. Berlandière, whose valuable collections were bought and presented to the Smithsonian Institute by Lieut. Couch. Specimens of all the species are deposited in the collection of that Institution, and also in that of the Academy, through the kindness of Prof. Baird, and the gentlemen named above. Figures of these, and all species described by me, will be published at some subsequent time.

Succinea Haydeni.—Testa elongato-ovalis, tenuis, pellucida, succinea; spira parva, acuta; anfr. 3 convexi, ultimus rugis levibus incrementalibus et sulcis crassis spiralibus, interruptis, inequaliter notatus; sutura mediocris; columella callo levi induta, apicem interiorem a basi testæ monstrans; apertura obliqua, ovalis, 5-7 long. testæ æquans, ad basin expansior. Long. 21; diam. 9 mill.

Habitat in provinciâ Nebraskâ, frequens inter flumina "Loup Fork," et "L'eau qui court" Dr. F. V. Hayden! (Yellowstone Ex. Ex.)

[May, 1858.]

Var. MINOR.—Long, 15 mill. ad "Red River of the North," legit R. Kennicott.

Shell elongate-oval, thin; shining, amber-colored; spire short, acute; whorls three, convex, the last marked with the wrinkles of growth, and irregular, heavy, spiral furrows; suture moderate; columella covered lightly with callus; and allowing all the interior whorls to be seen from below to the apex; aperture oblique, oval, 5-7ths the length of the shell, the lower portion of its margin considerably expanded.

Mr. Say describes *S. ovalis* as showing the interior apex from the base of the shell; in other respects his description does not apply to this shell. Its aperture is nearer that of *S. ovalis*, Gould non Say, but the peristome is much more flexuose, and the upper third of the shell becomes gradually attenuated, so as to give a sharp pointed appearance, though the spire itself is short. The revolving lines are sometimes continuous over the whole body whorl, but generally interrupted, or confined to the interstices of the incremental striae or wrinkles. It shares this peculiarity with *S. concordialis*, Gould, and *S. lineata*, nob.

Named in honor of Dr. F. V. Hayden.

HELIX COOPERI.—Testa umbilicata; elevato-globosa: solida; striis obliquis incrementi et lineis spiralibus leviter intercidentibus notata; alba, ad peripheriam fasciâ unicâ, angustâ, rufâ, cincta, aut fasciis et lineis rufis, volventibus, variè dispositis, ornata; sutura impressa; spira elevata; anfr. 5 convexi, ultimus rotundatus, ad aperturam valde descendens; umbilicus mediocris, pervius, 1-5 diam. maj. testæ æquans; apertura perobliqua, circularis; perist. simplex, incrassatum, ad umbilicum reflexiusculum, marginibus valde approximatis, callo albo, crasso, conjunctis. Diam. maj. 15; min. 13; alt. 9 mill.

Habitat, Black Hills, provinciâ Nebraskâ, frequens. Dr. F. V. Hayden! (Yellowstone R. Ex. Ex., Lieut. Warren.)

Shell umbilicated; elevated, globose; solid, with oblique incremental striae intersected with delicate spiral lines; color white, variously marked with a single narrow band, or broader longitudinal and spiral patches of reddish-brown; suture impressed; spire elevated; whorls five, convex, the last rounded, very decidedly deflected at the aperture; umbilicus moderate, pervious, 1-5th the greater diameter of the shell; aperture very oblique, circular; perist. simple, thickened, reflected at the umbilicus, with its extremities very nearly approaching, and joined by a heavy white callus.

Resembles nearly no described American species. Has an elevated spire like *H. pennsylvanica*, Green, and somewhat approaches *H. solitaria*, Say. It is, however, very much smaller, has rougher striae and revolving lines; the umbilicus is different, as is also the circular aperture, with nearly approaching ends like *H. vitata*, Mull., of Ceylon. There is a curious variety of *H. solitaria*, Say, found by Lieut. Bryan at Bridger's Pass, which may be compared with this in size, but the only specimen I have examined has no revolving lines, and wants the characteristic aperture. Some specimens of this species have a more flattened spire.

Named in honor of Dr. J. G. Cooper, of P. R. R. Survey.

HELIX NEWBERRYANA. Testa latè umbilicata; orbiculato-depressa; solida; striis tenuibus incrementi et lineis subtilissimis, spiralibus, leviter granulato-decussata; nigra, aut rufo-brunnea, sub epiderme alba; sutura valdè impressa; spira depressa; anfr. 6, regulariter accrescentes, superi plani, ultimus convexus, subtus rotundatus, ad aperturam descendens; umbilicus latus, perspectivus, anfr. omnes ad apicem monstrans; apertura obliqua, transverso-lunaris; in exemplis junioribus, paries aperturalis, sculpturâ anfr. præcedentis, callo levi oblitteratâ, eleganter notata est lineis elevatis, numerosis, confertis, spiralibus; in exemplis maturis, hæc sculptura occulta est callo incrassato, sed intus in anfr. omnibus remanet; perist. simplex, acutum, intus callosum, marginibus subconvergentibus, callo albo conjunctis. Diam. maj. 37; min. 20; alt. 13 mill.

Habitat in Californiâ. Specimina plurima collegit Dr. J. S. Newberry, (Colorado Ex. Ex. Lieut. Ives.)

[May,

Shell broadly umbilicated; orbicularly-depressed; solid; lightly decussated by incremental striæ, and numerous fine spiral lines: color black or reddish brown, under the epidermis white and shining; suture deeply impressed; spire depressed; whorls 6, regularly increasing, the upper ones flattened, the last convex, rounded below, and slightly deflected at the aperture; umbilicus broad, showing all the volutions clearly; aperture oblique, transversely-lunar; in young specimens the decussated sculpturing of the shell on the parietal wall of the aperture is covered with a light callus as the animal grows, and elegantly marked with numerous fine, crowded, spiral lines; in mature specimens this beautiful marking is entirely obliterated by the deposition of callus, but on breaking the shell, the lines will be found to exist within; peristome simple, acute, thickened within, ends slightly approximated, joined with a white callus.

This species bears no close resemblance to any known American *Helix*. It belongs to the same group as *H. vancouverensis*, Lea, but differs in size, color, number of whorls, umbilicus, want of peculiar depression of the lip, by its beautifully decussated surface, and peculiar parietal wall of the aperture. I know of no species sharing this last beautiful peculiarity. In form alone, dead specimens may be compared with *H. algira*, Lin., of Europe, but the spire is flatter and umbilicus larger.

Named in honor of Dr. J. S. Newberry, the Geologist of the Colorado Ex. Ex.

BULIMUS PATRIARCHA.—*T. perforata*, ovata, solidissima, alba, rugosa; anfr. 6 convexi, ultimus ventricosus, 5-7 long. testæ æquans; apertura ovata; perist. simplex, intus incrassatum, marginibus callo albo crasso junctis, columellari reflexo, umbilicum subtegente. Long. 35; diam. 19, aperturæ long. 19; diam. 13 mill.

Habitat in republicâ Mexicanâ. Specimina plurima et matura et nondum adulta, collegit Berlandière in Buenâ Vistâ.

Shell perforate, ovate, heavy, white and wrinkled; whorls 6, convex, the last ventricose, equalling in length 5-7 of the shell; aperture ovate; peristome simple, thickened within, the extremities joined by a heavy white callus, the columellar extremity slightly reflected so as partially to conceal the umbilicus.

Belongs to the same group as *Bul. dealbatus*, Say, *alternatus*, Say, *lactarius*, Mke., *liquatilis*, Reeve, *Schiedeanus*, Pf., &c. The characteristics which form its differences are alike present in young and old specimens, and constant in all from the locality. I therefore consider it as well entitled to specific distinction as those named.

Named from its greater size and more antiquated appearance, as compared with the allied species.



Notes on American Land Shells, No. 4.

BY W. G. BINNEY.

The following Catalogue of American Terrestrial Mollusks, is offered in the hope of drawing attention to the subject, and by exciting criticism, to furnish the first step towards an arrangement of the confused synonymy. The list is necessarily incomplete, as but a small portion of the oldest States has been thoroughly searched, and an immense extent of territory remains quite unexplored.

The species of the Pacific coast north of Mazatlan, are catalogued separately. The Mexican species will be published in a subsequent paper.

Reference is made only to authors giving a description or figure of each species.

I.

FAMILIA LIMACEA.

ARION.

1. *A. foliatus* Gld.

LIMAX.

2. *L. Columbianus* Gld.

FAMILIA HELICEA.

SUCCINEA.

3. *S. cingulata* Forbes.
4. *S. Nuttalliana* Lea, Pf., Binn.,
5. *S. Oregonensis* Lea, Pf., Binn.,
6. *S. rusticana* Gld., Pf.

Species exclusa.

S. aperta, Lea, Ins. Sandw. nec
Cal. teste Gould.

HELIX.

7. *H. acutidentata* W. G. Binn.
? var. β *Helix* Loisa, W. G. Binn.
H. æruginosa Gould, = *H. arrosa*.
8. *H. anachoreta* W. G. Binn.
H. arboretorum Val., = *Helix* Nickliniana.
9. *H. areolata* Pf., Phil., Chemn.,
Gld., Rve.
var. β Pfeiffer.
var. γ Pfeiffer.
H. areolata var. Chemn.
10. *H. arrosa* Gld. in litteris.
H. æruginosa Gld. (olim,) W. G. Binn.
11. *H. aspersa* Mull.?
H. Baskervillei Pf. &c. = *H. devia*.
12. *H. Californiensis* Lea, Tros.
Chemn., Rve., DeK., Binn.
H. vineta Val., Rve., Pf., Chemn.,
H. Californiensis Pf., Chemn., Rve.,
= *H. Nickliniana*.

13. *H. Columbiana* Lea, Tros.,
DeK., Chemn., Pf., Rve., Binn.
H. labiosa Gld., Pf.
H. damascenus Gld. = *H. Pandoræ*.
14. *H. devia* Gld., Pf.
H. Baskervillei Pf., Rve.
15. *H. Dupetithouarsi* Desh.,
Chemn., Pf., Rve., W. G. Binn.,
Gld.
(junior), *H. Oregonensis* Lea, Tros.,
DeK., Pf.
16. *H. exarata* Pf.?
17. *H. fidelis* Gray, Mull., Chemn.,
Pf., Rve., W. G. Binn.
H. Nuttalliana Lea, Tros., DeK.
Binn., Gld.
18. *H. germana* Gld., Pf.
19. *H. infumata* Gld., W. G. Binn.
20. *H. intercisa* W. G. Binn.
H. Nickliniana var. Binn.
21. *H. Kelletti* Forb., Chemn., Pf.,
Rve.
H. labiosa Gld., &c. = *H. Colum-*
biana.
H. Lecontii Lea, = *H. loricata* Gld.
22. *H. levis* Pf., Chemn.
var. β Pfeiffer.
23. *H. Loisa* W. G. Binn., (an *H.*
acutidentata, var.?)
24. *H. loricata* Gld., Pf.
H. Lecontii Lea, Pf.
25. *H. Mazatlanica* Pf.
26. *H. Mormonum* Pf.
H. nemoraviga Val., = *H. Nicklini-*
ana.
27. *H. Newberryana* W. G. Binn.
28. *H. Nickliniana* Lea, Tros.,
Binn., (excl. varr.)

- H. nemoraviga* Val.
H. arboretorum Val.
H. Californiensis Pf. (et. β .) Chemn.
 (excl. var. 2.) Rve.
H. Nuttalliana Lea, &c. = *H. fidelis*.
H. Oregonensis Lea, &c. = *H. Dupe-*
tithouarsi.
 29. *H. Pandoræ* Forb., Chemn., Pf.,
Rve., Gld.
H. damascenus Gld., olim.
 30. *H. ramentosa* Gld.
 31. *H. redemita* W. G. Binn.
H. Nickliniana var. Binn.
 32. *H. reticulata* Pf.
 33. *H. sportella* Gld., Pf.
H. vineta Val. &c. = *H. Californi-*
ensis.
Species exclusæ.
H. Sagraiana Orb., (teste Sowb.,
 Carp.) Ins. Cuba.
 BULIMUS.
 34. *B. Californicus* Rve., Pf.
 35. *B. chordatus* Pf.
B. elatus Gld., vid. *B. excelsus*.
 36. *B. excelsus* Gld.
B. elatus Gld., in tab.
 37. *B. Humboldti* Rve., Pf.
B. Mexicanus Val., nec Lam.
B. Mexicanus Pf. (excl. *B. Mexicanus*
 Val.)
 38. *B. Laurentii* Sowerby, &c., var.
 β . Pfeiffer.
 39. *B. Mexicanus* Lam., Deless.,
 Pf., Rve., nec Val.
Cochlogena vittata Fer.
B. Mexicanus Val., &c. = *B. Hum-*
boldti.
 40. *B. vegetus* Gld.
 (*B. pallidior* Sowb., teste Cuming.)
 41. *B. vesicalis* Gld.* *nomen trans-*
mutandum.
 42. *B. zebra* Muller, &c. vide *infra*.
 43. *B. Ziegleri* Pf., Rve.
 ACHATINA.
 44. *A. Californica* Pf., Rve.
Species exclusæ.
Achatina Albersi Pf. = *Glandina*.
Achatina turris Pf. = *Glandina*.
 GLANDINA.
 45. *G. Albersi* Pf.
46. *G. turris* (*Achatina*), Pf., Rve,
 Desh.
Glandina Albersi var. *turrita* P. P.
 Carp.
Oleacina turris Gr. et Pf.
 FAMILIA AURICULACEA.
 SUB-FAMILIA MELAMPEA.
 MELAMPUS.
 47. *M. olivaceus* Carp.
 FAMILIA ACICULACEA.
 TRUNCATELLA.
 48. *T. Californica* Pf.
Truncatella —? Carpenter.
 II.
 FAMILIA LIMACEA.
 VAGINULUS.
 49. *V. Floridianus* Binn.
Species exclusæ.
Vaginulus flexuolaris Grat.
 " *fuscus* Grat.
 " *oxyurus* Grat.
 " *quadrulus* Grat.
 TEBENNOPHORUS.
 50. *T. Carolinensis* (*Limax*),
 Bosc.
Limax Carolinianus De Roissy.
 " *Carolinensis* Fer., Bosc.
 Desh. in Lam., Mrs. Gray.
 " *marmoratus* DeK., (teste
 Newcomb, in litt.) Linsley?
 " *togata* Gld.
Philomycus Carolinensis Fer., Gr.
 et Pf.
T. Carolinensis Binn., Ad., DeK.,
 Stimp., (abs. desc.)
 51. *T. dorsalis* Binn.
Philomycus dorsalis Binn. (olim),
 Ad., Gr. et Pf.
Limax dorsalis DeK.
 ARION.
 52. *A. empiricorum* Fer., (teste
 Grat.)
 53. *A. hortensis* Fer., Binn., DeK.,
 Gr. et Pf.
Species exclusæ.
Arion foliatus Gld., (teste Grat.,)
 hab. litt. occid.
 LIMAX.
 54. *L. agrestis* Müll., Ad., DeK.,
 Gr. et Pf.
L. tunicata Gld.

*Dr. Gould suggests for *B. vesicalis*, the name *sufflatus*.

55. *L. campestris* Binn., Ad., DeK., Gr. et Pf.
L. flavus Binn., Gr. et Pf. = *L. variegatus*.
L. tunicata Gld., Gr. et Pf. = *L. agrestis*.
56. *L. variegatus* Fer., &c., Binn.
L. flavus Binn. olim, DeK., Gr. et Pf.
Species exclusæ.
L. Carolinianus De Roissy = *Tebennophorus Carolinensis*.
L. Carolinensis Fer., &c. = *Tebennophorus Carolinensis*.
L. Columbianus Gld., (teste Grat.)
L. dorsalis DeK. = *Tebennophorus dorsalis*.
L. fuliginosus Gld., (teste Grat.)
L. gracilis Raf., Gr. et Pf.
L. marmoratus DeK., Linsley, — *v. Tebennophorus Carolinensis*.
L. olivaceus Gld., teste Grat.
L. togata Gld., = *Tebennophorus Carolinensis*.
E Limacæis exclusæ.
Eumelus Raf.
“ *lividus* Raf.
“ *nebulosus* Raf.
Deroceas Raf.
“ *gracilis* Raf.
Philomycus Raf.
“ *Carolinensis* Fer. = *Tebennophorus Carolinensis*.
“ *dorsalis* Binn., (olim.) = *Tebennophorus dorsalis*.
“ *flexuolaris* Raf., Gr. et Pf.
“ *fuscus* Raf., Gr. et Pf.
“ *lividus* Gr. et Pf.
“ *nebulosus* Gr. et Pf.
Testacina Raf. teste Gr. et Pf.
Urcinella Raf., teste Gr. et Pf.
Zilotea Raf., teste Gr. et Pf.
Oxyrus Raf., Gr. et Pf.
“ *quadratus* Raf., Gr. et Pf.
FAMILIA HELICEA.
VITRINA.
57. *V. angelicæ* Beck. (abs. desc.) Möll., Pf.
Helix pellucida Fabr.
Helix domestica Ström, teste Fabr.
V. Americana Pf., &c. = *V. limpida*.
58. *V. limpida* Gld., Pf.
V. pellucida Say, Ad., DeK., Stimp., (abs. desc.) Binn., nec Müll.
V. Americana Pf., (olim.)
V. pellucida Say, &c. = *V. limpida*, SUCCINEA.
59. *S. aurea* Lea, Pf., Gld.,
S. ovalis teste Anthony, abs. desc.
60. *S. avara* Say, Ad., Gld., (excl. *S. vermæta*.) Pf., DeK., Chemn., Binn. (excl. *S. vermæta*).
S. Wardiana Lea, Pf.
var. major.
61. *S. campestris* Say, Pf., (excl. *S. campestris* Gld.,) Chemn. (excl. do.) Desh. in Fer., Binn., nec Gld., DeK., &c. Script. Am., (abs. desc.)
S. campestris Gld., &c. = *S. obliqua*.
62. *S. concordialis* Gld., Pf.
S. munita Binn., vol. 1, abs. desc.
63. *S. effusa* Shutt., Chemn., Pf.
64. *S. Groenlandica* Beck. (abs. desc.) Möll., Pf.
65. *S. Haydeni* W. G. Binn.
var. minor.
66. *S. inflata* Lea, Pf.
S. campestris var. (teste Binn.)
67. *S. lineata* W. G. Binn.
S. lineata DeK., = *S. obliqua*.
68. *S. luteola* Gld., Pf. in litt.
S. munita Binn. = *S. concordialis*.
69. *S. obliqua* Say, Ad., DeK., Chemn., Binn., (excl. *S. Totteniana*.)
S. ovalis Say, Ad., DeK., Desh. in Lam., Enc. Mech., et in Fer., Pf., Chemn., nec Gld.
S. campestris Gld., DeK., &c. Scr. Am., (absq. desc.), nec Say.
S. lineata DeK.
Cochlohydra ovalis Fer.
70. *S. ovalis* Gld., (non Say,) Binn., (excl. *S. ovalis* Ad., ?)
S. ovalis Say, &c. = *S. obliqua*.
71. *S. retusa* Lea, DeK., Pf.
S. ovalis Binn., (excl. syn. desc. et fig.)
S. campestris Anthony (pars.) abs. desc., nec Say.
72. *S. Salleana* Pf., Chemn.
S. Texasiana Pf. = *S. luteola*.
73. *S. Totteniana* Lea, Pf., Gld.
S. obliqua Binn., (pars.) nec Say.
74. *S. vermæta* Say. (= *S. avara*, Say, var. teste Gld., Ad., Binn., Pf.)

**H. Berlanderiana* Mor., Desh. in Lam., Chemn., Pf. in vol. iii., nec vol. i. Reeve, Binn.

H. pachyloma Mke., Pf. ?

H. virginalis Pf. ? Chemn. ?

S. Wardiana Lea, &c. = *S. avara*.

Species exclusæ.

S. amphibia Dr., an in Am.?

S. putris Lin., an in Am.?

HELIX.

H. objecta Gld., = *Helix divesta*.

75. *H. albolabris* Say, *Ad.*, *Binn.*, *Gld.*, *DeK.*, *Desh.* in *Fer.*, (excl. xlv. A. f. 7 et xliii. f. 4.) *Chenu*, *Chemn.* (excl. varr. C and D,) *Pf.* (excl. varr. γ δ), *Rve.*, *Billings*, *Bld.*, (excl. *H. majore*.)
Helicogena albolabris *Fer.*, (excl. γ .)
Lister fig. 45, *Petiver*, No. 3.
junior, *Helix rufa* *DeK.*
 var. = *dentata*.

H. albozonata *Binn.*, = *Helix gris eola*.

H. alliaria *Forb.* vid. *Helix Steeustrupii*.

H. annulata *Case.* = *Helix exigua*.

76. *H. alternata* Say, *Binn.*, *Ad.*, *Gld.*, *DeK.*, *Pf.*, *Desh.* in *Fer.*, *Pot.* et *Mich.*, *Chemn.*, *Rve.*, *Billings*.
Helicella alternata *Fer.*
H. scabra *Lam.*, *Chenu*, *Desh.* in *Lam.*, *DeK.*
H. radiata *Gmel.*
Petiver, No. 5, *List.*, t. 90, f. 69.
H. infecta *Pf.*
H. strongylodes *Pf.*? *Rve.*?
 Var. 1. *albina*.
 2. *Australis*.
 3. *carinata* (*H. mordax* *Sh.*?)
 4. *lævigatior*.

H. apex *Rve.*, = *H. minuscula*.

H. apicina *Menke.*, vid. *H. varians*.

77. *H. appressa* Say, *Binn.*, *DeK.*, *Chemn.*, *Pf.*, *Desh.* in *Fer.*, *Rve.*
H. linguifera *Lam.*, *Desh.* in *Lam.*, *Deless.*, *Chenu*, *Pf.*, (olim. *Symb.* 1.)
Helicodonta linguifera *Fer.*
 Var. a. *Say*.
 78. *H. arborea* Say, *Binn.*, *Ad.*, *Gld.*, *DeK.*, *Chemn.*, *Pf.*, (excl. *H. Ottonis*.) *Rve.*
Helicella arborea *Fer.*, (*H. nitidæ* var.)
 79. *H. Ariadnæ* *Pf.*, *Chemn.*
H. Couchiana *Lea*.
 80. *H. aspersa* *Müll.*, *Pf.*, &c., *Binn.*
 81. *H. asteriscus* *Morse*.
H. minutissima *Gld.*, nec *Lea*.

82. *H. auriculata* (*Polygyra*) *Say*.
H. auriculata *Binn.*, (excl. *H. avara* et *Texasiana*); *Chemn.*, *Desh.* in *Lam.* et in *Fer.*, *Pf.*, *Rve.*

Helicodonta auriculata *Fer.*,

" *minor* *Fer.*? *Conf.* *H. uvulifera*.

H. auriculata var. *avara*, *Binn.*?

83. *H. avara* (*Polygyra*.) *Say*.
H. avara *DeK.*, *Chemn.*? *Pf.*, *Rve.*? *Desh.* in *Fer.*
H. auriculata *Binn.*, *pars.*?
H. Sayi *Wood*.
Helicodonta avara *Fer.*
 84. *H. barbiger a* *Redf.*, *Gld.**
H. bicostata *Pf.* &c., = *Helix gularis*.
 85. *H. bucculenta* *Gld.*, *Pf.*
H. thyroides var. β . *Pf.*?
Helicodonta thyroides var. β , *Fer.*?
 Var. *minor*.

86. *H. bulbina* *Desh.* in *Fer.*

H. capillacea *Pf.*, = *H. fuliginosa*.

87. *H. capsella* *Gld.*

H. rotula *Gld.*, (olim. nec *Lowe*), *Pf.*
H. placentula *Shutt.*, *Pf.*, *Gld.*

H. carnicolor *Pf.*, &c., = *H. varians*.
H. carolinensis *Lea*, &c., vid. *H. palliata*.

88. *H. cellaria* *Müll.* *Pf.* &c., *Binn.*, *Gld.*, *DeK.*
 ? *H. glaphyra* *Say*, nec *Pf.*, *Bld.*
Helicella glaphyra *Fer.*, abs. desc.

89. *H. cereolus* *Muhl.*, *Chemn.*, *Pf.* *Rve.*

Polygyra septemvolva *Say*.

H. septemvolva *Binn.*, (*pars*), *Wood*, *Sow.*, *Pot.* et *Mich.*, *Desh.* in *Fer.*

Helicodonta septemvolva *Fer.*

H. planorbula *Lam.*, *Desh.* in *Lam.*, *Chenu*, *Deless.*

Var. *laminifera*.

90. *H. chersina* Say, *Binn.*, (excl. *H. egena*), *Ad.*, *Gld.* *DeK.*

H. fulva, teste *Chemn.*, *Pf.*, *Rve.*, *Forb.* & *Hanl.*

H. cicericula *Fer.* = *H. griseola*.

91. *H. Clarkii* *Lea*.

92. *H. clausa* Say, *Chenu.*, *DeK.*? *Binn.* in *Terr. Moll.* (excl. *synon.*) *Bld.*

H. Pennsylvanica *Pf.* *pars.*, *Rve.*, *Chemn.* *pars.*, nec *Green*.

Var.

H. clausa *Binn.* fig. in *Bost. Journ.*

- H. clausa* Pf., Fer., &c. = *H. in-flecta*.
93. *H. concava* Say, Binn. in *T. M.*, Ad. DeK., Binn. in *B. J.* (excl. syn. et tab.)
- H. planorboides* Pf., Chemn., Rve., Desh. in Fer.
- Helicella planorboides* Fer. abs. des. *H. dissidens* Desh.
- H. convexa* Chemn., Pf., &c. = *H. monodon*.
- H. (Stenostoma) convexa* Raf. = *H. hirsuta*.
94. *H. Cooperi* W. G. Binn.
- H. costata* Mull., = *H. pulchella*.
- H. Couchiana* Lea, = *H. Ariadnae*.
95. *H. Cumberlandiana* (*Carocol-la*) Lea, Tros.
- H. Cumberlandiana* Binn., DeK., Rve. Pf.
- H. (Omphalina) cuprea* Raf., vid. *H. fuliginosa*.
- H. dejecta* Gld. = *Helix divesta*.
6. *H. demissa* Binn., Pf., Rve.
- H. (Helicodonta) denotata* Fer. &c. = *Helix palliata*.
97. *H. dentifera* Binn., Ad., DeK., Mrs. Gray, Pf., (excl. syn.) Chemn., (excl. syn. et fig.)
- H. diodonta* Say, &c. = *Helix Sayii* Binn.
98. *H. divesta* Gld.
- H. abjecta* Gld., (olim.,) Pf.
- H. dejecta* Gld., olim.
99. *H. Dorfeuilliana* (*Polygyra*) Lea, Tros.
- H. fatigiata* Binn., (pars. excl. syn. et fig.)
- H. Dorfeuilliana* Bld. nec. Pf., Desh. in Fer., Rve.
- H. Dorfeuilliana* Desh. = *H. Hazardi*.
100. *H. Edgariana* (*Carocol-la*) Lea, Tros.
- H. Edgariana* Pf., Rve., Gld.
- H. spinosa* var. Binn.
101. *H. Edwardsi* Bld.
102. *H. egena* Say, DeK., Chemn., Pf., Rve.
- non *H. egena* Gld., in Terr. Moll.
- H. egena* Gld. = *Helix Gundlachi*.
103. *H. electrina* Gld., Binn., DeK., Ad.
- H. nitidosa* var. Pf., olim.
- H. pura* pars Chemn., Pf., Rve.
104. *H. elevata* Say, Binn., DeK., Chemn., Pf., Mrs. Gray, Rve., Desh. in Fer. (excl. *H. elevata* Orb.)
- Helicodonta Knoxvilliana* Fer.
- junior *Helix Tennesseeensis* Lea, Pf.
105. *H. Elliotti* Redf., Gld.
106. *H. exigua* Stim., Pf., Gld.
- H. annulata* Case, Pf., Ann. et Mag. N. H.
- H. striatella* junior, teste Gld., olim (Sill. Journ.)
107. *H. exoleta* Binn. DeK.
- H. albolabris* ♂ *unidentata* Pf., olim.
- “ var. D. Chemn.
- Helicodonta albolabris* var. Fer.
- H. zaleta* Binn. olim, Pf., Desh. in Fer., Rve., Mrs. Gray.
108. *H. Fabricii* (*Petasia*) Beck.
- H. Fabricii* Moll., Pf., Rve.
- H. Hammonis* Strom.?
- H. nitida* Fabr.?
- H. alliarum* Forb. teste Mörch.
109. *H. fallax* Say, DeK., Chemn., Pf., Rve.
- H. tridentata* Binn., pars.
110. *H. fatigiata* (*Polygyra*) Say.
- H. fatigiata* Binn., (in B. J. ex parte, excl. syn. et fig.) ditto. in Terr. Moll. (ex parte, excl. syn. et t. xxxix. f. 2.) Shut., Bland.
- H. Texasiana* var. B. Chemn., (excl. desc. syn. et fig.) Desh. in Fer., (excl. desc. syn. et fig.)
- H. Texasiana* ♂ Pf., (excl. desc. et syn.)
- H. Dorfeuilliana* Desh. in Fer., (excl. syn.)
- Helicina fatigiata* DeK.
- H. fatigiata* Binn., pars vid. *H. Hazardi*.
- H. florulifera* Rve. = *Helix uvulifera*.
- H. fraterna* Say, &c., vid. *H. monodon*.
- H. fraterna* Wood = *Helix hirsuta*.
111. *H. friabilis* W. G. Binn.
- H. lucubrata* Pf. in litt.
112. *H. fuliginosa* Binn., (in Bost. J., excl. *H. lucubrata* et *H. laevigata*) do. in Terr. Moll. (excl. *H. laevigata*), Ads., (excl. *H. lucubrata*) DeK., Chemn. Pf., Rve.?

- H. capillacea* Pf., olim, nec. Fer.
Omphalina cuprea Raf.?
H. glaphyra Pf., Rve. = *Helix inornata*.
H. glaphyra Say, vid. *Helix cellaria*.
113. *H. griseola* Pf., Chemn., Rve.,
H. splendidula An. (abs. desc.)
 teste Pf.
H. cicercula Fer., MSS. teste Pf.,
Brandybæne pisum, Beck (In
 dex) teste Pf.
H. albozonata Binn.?
114. *H. gularis* Say, Binn., DeK.,
 Chemn. (excl. var.) Mrs. Gray,
 Pf. (excl. var. β) Rve.
H. bicostata Pf., (olim. nec in
 litteris), Chemn., Rve.
Helicodonta gularis, Fer.
Helicostyla Rafinesquea, Fer.?
 var. *umbilicata*.
115. *H. Gundlachi* Pf. Chemn.
H. pusilla Pf., olim. nec Lowe.
H. egena Gld., nec Say.
H. Hammonis Strom. = *Helix Fabricii*.?
116. *H. Hazardi* Bland.
Polygyra plicata, Say.
H. fatigiata Binn. in Bost., J.,
 (excl. syn. et t. xix. f. 3), ditto
 in Terr. Moll. (excl. syn. et f.
 3.)
H. Texasiana Pf., (excl. desc. et
 fig.) Chemn., (excl. desc. syn.
 et fig.)
H. Dorfeuilliana Desh. in Fer.,
 (excl. desc. syn. et fig.) nec
 Lea.
H. Troostiana W. G. Binn., olim.
 nec Lea.
Helicina plicata DeK.
H. (Carocolla) helicoides Lea = *H.*
obstricta, Say.
117. *H. Hindsii* Pf., Chemn., Rve.,
 Gld.
118. *H. hippocrepsis* Pf., Rve.,
 Chemn.
119. *H. hirsuta* Say, Binn., (excl.,
H. stenotrema), DeK., Gld.,
 Desh. in Lam. et En. M., Mrs.
 Gray, Chemn., (excl. var.), Pf.,
 (excl. β), Rve., Desh. in Fer.
H. fraterna, Wood.
H. sinuata γ Gmelin.
H. isognomostomus γ Gmelin ex
 parte.
- Helicodonta hirsuta* Fer., (excl.
 var. a).
Tridopsis hirsuta Woodw.
Stenostoma convexa Raf.
 ? junior *H. porcina* Say, DeK.,
 Pf., Bland.
120. *H. hispida* Linn.
121. *H. Hopetonensis* Shut., Rve.,
 Chemn., Pf., Gld.
H. tridentata Binn. (ex parte),
 Fer., (ex parte), nec Say.
122. *H. hortensis* Mull., Binn.,
 Gld.
H. nemoralis Stim., (abs. des.)
H. subglobosa Binn., (olim.) DeK.
123. *H. hydrophila* Ingalls ined.
H. lucida Drap. teste Binn.,
 Gld., et Pf., in litteris.
124. *H. incrustata* Poey, Pf.
H. saricola Binn., Gld. in Terr.
 Moll., nec Pf.
125. *H. indentata* Say, Binn.,
 DeK., Gld., Ad., Chemn., Pf.,
 Rve.
 var. *umbilicata*.
H. infecta Pf. = *H. alternata*.
126. *H. inflecta* Say, Binn., DeK.,
 Mrs. Gray.
Xolotrema clausa Raf.
Helicodonta clausa Fer.
Helix clausa, Desh. in Lam.,
 Chemn., Pf., Desh. in Fer., Rve.,
 nec Say.
 Lister, 93, f. 93?
 junior? *H. porcina* Say, &c.
127. *H. inornata* Say, Binn., Ad.,
 DeK., Pf. in Symb. 1, (excl. *H.*
fuliginosa) et Mon.
H. glaphyra Pf. Rve., nec Say.
H. inornata Rve. = *H. lævigata*.
128. *H. interna* Say, Binn., DeK.,
 Chemn., Pf., Rve.
H. pomum-Adami Green.
 var. *albina*.
129. *H. intertexta* Binn., DeK.,
 Chemn., Phil., Pf., Rve.
 var. *carinata*.
H. isognomostomus, Gmel. vid. *H.*
hirsuta.
130. *H. jejuna* Say, DeK., Pf.,
 Bland.
H. Mobiliana Lea, Pf., Binn.
 " junior ? teste, Pf.
 in litteris.

- H. (Helicodonta) Knoxvilliana* Fer., = *H. elevata*.
131. *H. kopnodes* W. G. Binn.
132. *H. labyrinthica* Say, Binn., Gld., Ad., Pf., DeK., Chemn., Desh. in Fer., Rve.
Helicodonta labyrinthica Fer.
133. *H. lævigata* Pf., (excl. *H. inornata*.) Chemn., Rve.
Helicella lævigata Fer. ? absq. desc.
H. inornata Rve., (excl. syn.).
H. lucubrata Binn., in Terr. Moll., (excl. syn.) nec Sav.
H. fuliginosa Binn. in B. J., pars. (excl. desc. syn. et fig.)
var. major. Pf., (an *H. lævigata*, Rve.?)
134. *H. lasmodon* Phill., DeK., Pf., Binn.
? *H. macilenta* Shutt., Gld., Pf.
H. Lavelleana Orb. vid. *H. minuscula*.
135. *H. leporina* Gld., Rve., Bld.
H. pustula, var. β Pf.
136. *H. ligera* Say, Binn., DeK., (excl. fig.) Chemn., Pf., Desh. in Fer., Rve.
Helicostyla Rafinesquea Fer.? *H. Rafinesquea* Pf., olim. Lister, p. 81, f. 82.
H. Wardiana Lea, Tros., DeK.
137. *H. limatula* Ward. in Binn., Pf.
138. *H. lineata* Say, Binn., Ad., Gld., Pf., DeK., Chemn., Desh. in Fer., Rve.
Helicella lineata Fer.
Planorbis parallelus Say.? *H. lucida* Binn., &c., vid. *H. hydrophila*.
H. lucubrata Binn. = *H. lævigata*.
H. lucubrata Pf. in litteris = *H. friabilis*.
H. macilenta Shutt. = *H. lasmodon*.
139. *H. major* Binn., DeK., Mrs. Gray.
H. albolabris Pf., (γ maxima), Chemn. (C), Desh. in Fer., (pars t. 43, f. 4, et 46 A., f. 7,) Rve. 656?, Bld., nec Say.
Helicogena albolabris γ Fer.
H. Mauriniana Orb. vid. *H. minuscula*.
140. *H. microdonta* Desh. in Fer., Chemn., Pf., Rve.
H. plana Dunker.
141. *H. minuscula* Binn., (excl. syn.), Pf., (excl. minutissima?) Ad., Chemn., Rve., Shutt.
H. minutalis More., nec Fer.
H. apex Rve.
H. Lavelleana Orb. in textu.
H. Mauriniana Orb. in tab.
H. minuta Say = *H. pulchella*.
H. minutalis Mor. = *H. minuscula*.
142. *H. minutissima* Lea, Tros., Pf.
H. Mitchellia Kirt. = *H. Mitchelliana*?
143. *H. Mitchelliana* Lea, Tros., DeK., Chemn.? Pf., Bld., nec Desh. in Fer.
H. clausa Binn., pars nec Say.
H. Mitchellia Kirt.? absq. desc.
H. Mitchelliana Desh. = *H. Pennsylvanica*.
H. Mobiliana Lea = *H. jejuna*.
144. *H. monodon* Rack., Binn. in Bost. J., Gld., DeK., Mrs. Gray, Bill., Binn. in Terr. Moll., (excl. *H. fraterna*).
H. convexa Chemn., (excl. syn. et t. 66, f. 24-27), Pf., (excl. β et γ), Desh. in Lam. et in Fer., Rve.
Helicodonta hirsuta, a, Fer., (excl. syn.).
var. 1. *H. fraterna* Say, Binn. in B. J., Mrs. Gray.
H. monodon, ex parte DeK., Binn. in Terr. Moll.
H. monodon Wood.
H. convexa Chemn. pars.
" var. Rve.
" var. β Pf.
var. 2. *H. Leaia* Ward, ined.
H. monodon, var. γ Pf.
" ex parte Binn.
145. *H. Mooreana* W. G. Binn.
146. *H. mordax* Shutt., Pf., Gld., conf. *H. alternata* var. *carinata*.
147. *H. multidentata* Binn., Ad., Chemn., Pf., Rve.
148. *H. multilineata* Say, Binn., DeK., Pf., Chemn., Desh. in Fer., Rve.
Helicogena multilineata, Fer.
var. *albina*.
var. *rufa*, unicolor.

- H. nemoralis* St. = *H. hortensis*.
H. nitida Fabr. vid. *H. Steens-trupii*.
H. nitidosa var. Pf. = *H. electrina*.
H. notata Desh. = *H. palliata*.
 149. *H. obstricta* Say, Pf., Rve.
H. palliata var. a. Say.
 " var. a. b. DeK.
H. palliata var. Binn.
H. appressa var. Desh. in Fer.,
 (in tab. non in tex).
Helicodonta denotata var. Fer.
Carocolla helicoides Lea.
 150. *H. Ottonis* Pf., olim, Binn.
H. arborea Pf. (Mon., pars), Rve.,
 (pars,) nec Say.
 151. *H. palliata* Say, Binn., (excl.
H. obstricta, et *Car. helicoides*)
Ad., DeK., (excl. var. a. b.)
Chemn., Pf., Mrs. Gray, Desh.
 in Fer., Rve.
Helicodonta denotata Fer., (excl.
 var.).
H. denotata Desh. in Lam.
H. notata Desh. (olim).
 var. *Carolinensis*.
H. Carolinensis Lea.
H. palliata var. c., DeK.
 " pars. Fer., Binn.,
 Chemn., Pf., Desh. in Fer.,
 Rve.
H. patula Desh. = *H. perspectiva*.
H. patula ? Pf. = *H. striatella*.
 152. *H. Pennsylvanica* Green,
 Binn., DeK., Pf., (excl. *H.*
 clausa,) *Chemn.*, (excl. *H.*
 clausa,) Mrs. Gray, Rve. (676,
 excl. syn.) Bld.
H. Mitchelliana Desh. in Fer.,
 nec Lea.
H. Pennsylvanica Pf., &c., nec
 Green = *H. clausa*.
 153. *H. perspectiva* Say, Binn.,
 DeK., Pot. et Mich., Desh.
 in Lam. et in Fer., *Chemn.*,
 Pf., (excl. *H. filiola* olim) Rve.
Helicella perspectiva Fer.
H. patula Desh., olim.
H. pisana Mart. & Chem. = *H.*
 varians.
H. placentula Shutt. = *H. cap-*
 sella.
H. plana Dunk. = *H. microdon-*
 ta.
H. planorboides Pf., &c. = *H.*
 concaua.
H. planorbula Lam. = *H. cereo-*
 lus.
H. plicata Shutt. = *H. Trostiana*.
H. (Polygyra) plicata Say = *H.*
 Hazardi.
H. polychroa Binn. = *H. varians*.
H. pomum-Adami Green = *H. in-*
 terna.
H. porcina Say, vid. *H. hirsuta*
 et *H. inflecta*.
 154. *H. profunda* Say, Binn., DeK.,
 Chemn., Pf., Chenu, Desh. in
 Fer., Rve., Mrs. Gray.
Helicella Richardi Fer.
H. Richardi Lam., Desh. in Lam.
 et En. Meth., Deless., Chenu.
Polygyra profundum Ad. Gen., abs.
 desc?
 var. *unicolor*.
 var. *albina*.
 155. *H. pulchella* Mull., Binn.,
 Ad., Gld, Say in MSS.
H. minuta Say, DeK., Stimp.
 var. *costata*, *H. costata*, Mull.
H. pura vid. *H. electrina*.
H. pusilla Pf. = *H. Gundlachi*.
 156. *H. pustula* (*Helicodonta*) Fer.
H. pustula Pf., (excl., var. β)
Chemn., Desh. in Fer., Rve.,
 Bld., non Binn.
H. fatigiata Binn., olim (ex parte
 excl. desc. syn, et fig.)
H. leporina W. G. Binn., olim ex
 parte.
H. pustula Binn. = *H. pustu-*
 loides.
 157. *H. pustuloides* Bld.
H. pustula Binn., non Fer.
H. (Helicostyla) Rafinesquea Fer.,
 vid. *H. ligera* et *H. gularis*.
H. radiata Gmel. = *H. alternata*.
H. rhodocheila Binn. = *H. vari-*
 ans.
H. Richardi Fer. &c. = *H. pro-*
 funda.
 158. *H. Roëmeri* Pf. olim, Rve.
H. dentifera Pf. pars, *Chemn.*
 pars. nec Binn.
H. rotula Gld. = *H. capsella*.
H. ruderata Ad. = *H. striatella*.
H. rufa DeK. = *H. albolabris ju-*
 nior.
 159. *H. Rugeli* Shutt., Pf., Gld.

160. *H. Sayii* Binn., Ad., Chemn., Mrs. Gray, Pf., Desh. in Fer., Rve.
H. diodonta Say, DeK.
H. Sayii Wood. = *H. avara*.
H. saxicola Binn., Gld. = *H. in-crustata*.
H. scabra Lam. &c. = *H. alternata*.
161. *H. sculptilis* Bld.
H. selenina Gld. = *H. vortex*.
H. sinuata γ Gmel. = *H. hirsuta*.
162. *H. solitaria* Say, Binn., DeK., Pf., Chemn., Rve.
 var. minor.
163. *H. spinosa* (Carocolla,) Lea.
H. spinosa Binn., (excl. *H. Edgariana*) DeK., Chemn., Pf., Rve.
H. splendidula Anton = *H. griseola*.
164. *H. Steenstrupii* (*Helicella*) Mörch.
Helicella n. s. Steens., teste Mörch.
H. alliaria Forbes Br. Ass., teste Mörch.
H. nitida Fab., teste Mörch conf. H. Fabricii.
165. *H. stenotrema* Fer., (ined.) in Pf. Sym., (excl. *H. pustula*?) Rve.
H. hirsuta var. β., Pf. Mon.
H. hirsuta var. *stenotrema*, Chemn.
H. hirsuta var. β., Pf.
166. *H. striatella* Anth., Binn., Gld., Ad. olim, DeK., (excl. syn.) Chemn., Pf., (excl. *H. perspectiva*, olim) Rve.
H. patula junior? Pf. olim.
H. rudrata Ad., nec Studer.
H. strongylodes Pf. = *H. alternata*.
H. subglobosa Binn., &c. = *H. hortensis*.
H. submeris Mighels = *H. varians*.
167. *H. subplana* Binn., Pf.
168. *H. suppressa* Say, Binn., DeK., Rve.
H. gularis var. β Pf.,
 " var. Chemn.
H. Tamaulipasensis Lea, = *H. Texasiana*.
H. Tennesseensis Lea, = *H. elevata*.
169. *H. tenuistriata* Binn., Pf.
H. vortex Gld., (excl. desc. syn. et fig.) nec Pf.
170. *H. Texasiana* Mor., Pf., (excl. syn. et var. β), Chemn., (excl. var. et fig.) Desh. in Lam. 3d ed., Shutt., Rve., Desh. in Fer.? Binn.
H. auriculata Binn., olim, ex parte, nec Say.
H. fatigiata Fer., Bull. Zool., nec Say.
 var. β Pf.
 var. (an sp. dist.?) *H. triodonta*, Iahn.? (*H. Texasiana* Fer., 69 D. f. 2, teste Pf.)
171. *H. tholus* W. G. Binn.
172. *H. thyroides* Say.
H. thyroides Say, Binn., Ad., Gld., DeK., Mrs. Gray, Desh. in Lam. 3d ed.
Helicodonta thyroides Fer., (excl. var. β).
H. thyroides Chemn., Pf., Rve.
Anchiostoma thyroides Ad. Gen. Lister, f. 91, Petiver No. 4.
173. *H. tridentata* Say, Binn., (excl. syn.) Ad., Gld., DeK., Pot. et Mich., Wood, Chemn., Pf., Desh. in Lam. et in Fer., Mrs. Gray, Rve.
Helicodonta tridentata Fer.
Triodopsis lunula Raf.
 Lister, fig. 92.
 Petiver No. 6.
174. *H. Troostiana* (*Polygyra*) Lea, Tros.
H. Troostiana Pf., Desh. in Fer.? Chemn., Rve., Bland.
H. fatigiata Binn., (in tab. Bost. J. in textu ex parte excl. syn.) in Terr., Moll., (ex parte excl. syn. et fig.) nec Say.
H. fatigiata var. *plicata*, Binn., in tab. Terr. Moll.
H. plicata Shutt., nec. Say.
175. *H. uvulifera* Shutt., Chemn., Pf., Gld.
H. florulifera Rve.
H. auriculata minor Fer.?
176. *H. varians* Menke, Chemn., Pf., Rve.
H. carnicolor Pf. olim, Desh. in Fer., Rve.
H. pisana Mart. et Chemn., Fer.? nec Mull.
H. submeris Migh., Pf.
H. rhodocheila Binn., olim.
H. polychroa Binn.
Helicella carnicolor Fer.
Hemitrochus hamastomus Sowb.

- var. β *H. apicina* Menke, (Chemn.)
177. *H. ventrosula* Pf., Chemn., Rve.
var. *depressa*.
178. *H. volvox* Pf., Chemn., Rve.
Polygyra septemvolva Beck? (Pf.)
179. *H. vortex* Pf., Chemn., Rve., Gld.
H. selenina Gld. olim, Rve.
180. *H. vultuosa* Gld., Reeve, Chemn., Pf.
H. Wardiana Lea = *H. ligera*.
H. zaleta Binn., &c. = *H. exoleta*.
Species exclusæ.
H. arborum Linn.
H. Bonplandi Lam., Florida?
H. harpa Say = *Bulimus*.
H. dealbata Say, DeK. = *Bul. dealbatus*.
H. depicta Grat.
H. domestica Ström. = *Vitrina angelicæ*.
H. hieroglyphica (Euryomphala,) Beck?
H. irrorata Say = *H. lactea*.
H. lactea Muller, Say.
Helix irrorata Say olim, DeK., Pf. olim.
H. nemoralis Lin.? (teste Gray.)
H. pellucida Fabr. = *Vitrina angelicæ*.
H. Pisana Mull. ? teste Gray.
H. subcylindrica Pult., Mont. = *Truncatella*.
H. Trumbulli Lins. = *Skenia serploides*, Mont., teste Gld.
H. virgata Mont. ? (teste Gray.)
- BULIMUS.
181. *B. acicula* (Buccinum,) Müller, &c.
182. *B. alternatus* Say, Pf.
B. lactarius Pf. Rve., Gld., W. G. Binn.
B. dealbatus Binn. pars. nec Say.
183. *B. Binneyanus* Pf. in litt.
B. dealbatus Binn. pars, nec Say.
B. Schiedeanus Gld., W. G. Binn., nec Pf.
B. confinis Rve., &c. = *B. dealbatus*.
184. *B. dealbatus* (Helix) Say, DeK.
B. dealbatus Pot. et Mich., Phil., Rve., Pf., Chemn., Binn., (excl. varr.)
- B. confinis* Rve., Pf.
B. liquabilis Rve.
185. *B. decollatus* (Helix) Linn., Binn., &c.
B. mutilatus Say, DeK., Pf., Rve.
186. *B. Dormani* W. G. Binn.
187. *B. Floridianus* Pf.
188. *B. gracillimus* Pf., Rve.
Achatina gracillima Pf. olim, Binn.
B. striaticostatus Orb.
189. *B. harpa* (Helix) Say.
B. harpa Pf., Chemn., Rve. Binn.
Pupa costulata Migh.
B. hortensis Ad. = *B. subula*?
B. lactarius Pf. &c. = *B. alternatus*.
B. liquabilis Rve. = *B. dealbatus*.
190. *B. marginatus* (Cyclostoma) Say.
B. marginatus Pf.
B. fallax Gld. in Binn., Stimp. ab. desc.
Pupa fallax Say, Gld., DeK., Chemn., Pf., (olim).
Pupa albilabris Ad.
" *Parraiana* Orb.
191. *B. multilineatus* Say, DeK., Pf.
B. virgulatus Binn. (excl. syn.) nec Fer.
B. Menkei Gruner, Pf?
B. venosus Rve.?
B. mutilatus Say = *B. decollatus*.
192. *B. octona* Ch. (in hortis.)
B. octonoides Orb. = *B. subula*.
B. princeps Brod. &c., = *B. zebra*,
B. procerus Ad. = *B. subula*.
193. *B. Schiedeanus* Pf., Phil., Chemn.
var. β *fauce nigra*.
var. γ *apice nigra*.
194. *B. serperastrus* Say, Rve., Phil., Chemn., Pf., Binn.
var. β ? vid. Cat. Mex.
var. γ ? vid. Cat. Mex.
B. straticostatus Orb. = *B. gracillimus*.
195. *B. subula* Pf., Rve., Binn.
B. procerus Ad., teste Pf.
B. octonoides Orb.
B. hortensis Ad.?
Achatina subula Pf., olim.
B. undatus Brug. &c. = *B. zebra*.
196. *B. zebra* (Buccinum) Müll.

Zebra Mulleri Mart. et Chemn.
Bulla zebra Gmelin, Dill.
Bulimus undatus Brug., Lam.,
 Chemn., Val.

Cochlostyla undata Fer.
B. zebra Ant., Orb., Pf., Rve.,
 Desh., Chemn., Binn.

Achatina flammigera Say, nec Fer.
 " *zebra* Pf., (olim.)

Agatina fuscata Raf.
Orthaliscus undatus Shutt.
 var. γ . *Bulimus princeps* Brod.,
 Sowb.

Cochlostyla princeps Orb.
Orthaliscus princeps Shutt.

Species exclusæ.

B. exiguus Binn. = *Carychium*.
B. fasciatus Binn. = *Achatina*.
B. Gossei Pf., vid. *Macroceramus*
pontificus.

B. Kieneri Pf., vid. *Macroceramus*
pontificus.

Bulimus lubricus Ad., &c., = *Acha-*
tina.

B. obscurus Dr. vid. *Pupa placida*
 Say.

B. striatus Brug. = *Glandina trun-*
cata.

B. vexillum Brug. = *Achatina fas-*
ciata.

B. zebra Orb. = *Achatina fasciata*.

MACROCERAMUS.

197. *M. pontificus* (*Cylindrella*)
Gld.

Cylindrella pontifica Gld. in Binn.
 = *Bulimus Kieneri* Pf., (teste Pf.)
 = *Bulimus Gossei* Pf. (teste Poey.)
Pupa unicarinata Binn.

ACHATINA.

Achatina Anais Less. = *Ach. fas-*
ciata.

198. *A. fasciata* (*Buccinum*) Müll.

Bulla fasciata Mart. et Chemn.,
 Gmel., Dill.

Bulimus vexillum Brug., nec DeK.
Cochlitoma vexillum Fer.

Achatina vexillum Lam., Chemn.
Achatina fasciata Swain., Reeve,
 Orb., Pf., Desh. in Fer.

Achatina lineata Valen.
 Lister t. 12, f. 7. Knorr. t. 25, f. 4.

Bulimus fasciatus Binn.
Agatina variegata Raf.

junior Achatina murrhea Rve.
 Var. β . *Achatina pallida* Swain.

Cochlitoma vexillum var. Fer.

var. γ . *Achatina crenata* Swain.

" *anais* Less., Wieg. Ach.

" *fasciata* var. Rve.

Cochlitoma vexillum var. Fer.

Bulimus zebra Orb.

var. ξ . *Achatina solida* Say, DeK.,
 Pf., olim.

Achatina lineata Val. = *Ach. fas-*
ciata.

199. *A. lubrica* (*Helix*) Müll.

Achatina lubrica Pf.

Bulimus lubricus Ad., Gld., DeK.,
 Binn.

Bulimus lubricoides Stimps. abs. des.

A. murrhea Reeve = *Ach. fasci-*
ata.

A. pallida Sw. = *Ach. fasciata*.

200. *A. picta* Rve., Trosch. Pf.

Bulimus fasciatus var. Binn.

A. solida Say = *Ach. fasciata*.

A. vexillum Lam. = *Ach. fasciata*.

Exclusæ.

A. bullata Pf. = *Glandina*.

A. flammigera Say = *Bulimus ze-*
bra.

A. gracillima Pf. = *Bulimus gra-*
cillimus.

A. pelucida Pf. olim, Binn. = *Blau-*
neria.

A. rosea Desh. = *Glandina trun-*
cata.

A. striata DeK., &c. = *Gl. trun-*
cata?

A. subula Pf. = *Bulimus*.

A. Texasiana Pf. = *Glandina*.

A. truncata Pf., &c. = *Glandina*.

A. vexillum DeK., v. *A. virginica*.

A. Vanuxemensis Pf., &c. = *Glan-*
dina.

A. virginica Linn. (*A. vexillum* DeK.
 nec Brug.) an in Florida?

GLANDINA.

201. *G. bullata* Gld.

Achatina bullata Pf.

Oleacina bullata Gr. et Pf.

202. *G. corneola* W. G. Binn.

Glandina truncata var? Binn.

203. *G. parallela* W. G. Binn.

Glandina truncata var. Binn.

204. *G. Texasiana* (*Achatina*) Pf.,

W. G. Binn.

205. *G. truncata* (*Bulla*) Gml. Dill.

Buccinum striatum Mart. et Chemn.

Bulimus striatus Brug.

Cochlicopa rosea Fer.

- Achatina rosea* Desh. in En. Meth.
 " *striata* Desh. in Lam., Ch.
 " *truncata* Orb., Chemn., Pf.,
 Reeve.
Glandina truncata Say, DeK., Chem.
 Mrs. Gray, Binn. (excl. var.)
Oleacina truncata Gr. et Pf.
Polyphemus glans Say, olim.
Planorbis glans DeK.
206. *G. Vanuxemensis* Lea, Binn.,
 Pf. olim.
Achatina Vanuxemensis Pf. Reeve.
Oleacina Vanuxemensis Gr. et Pf.
- PUPA.
- Pupa armigera* Pot. et Mich. = *P. armifera*.
 207. *P. armifera* (*Carychium*?) Say.
Pupa armifera Gld., Ad., Pf., DeK.,
 Chemn., Binn.
 " *armigera* Pot. et Mich.
 " *rupicola* Pf. (Symb.)
 208. *P. badia* Ad. Gld., DeK., Chemn.,
 Binn.
Pupa muscorum Linn. (teste Forb.
 et Hanl.)
 " *muscorum*, β . Pf.
Pupa carinata Gld. = *P. rupicola*.
 209. *P. contracta* (*Carychium*) Say.
Pupa contracta Gld., Pf., DeK.,
 Chemn., Binn.
Pupa deltostoma Charp. in Chemn.
 " *corticaria* Pf., (Symb.)
Vertigo contracta Ad. Gen. abs. desc.
 210. *P. corticaria* Say, Gld., DeK.,
 Chemn., Binn., (*Vertigo*?)
Odotostomia corticaria Say, olim.
Carychium corticaria Fer. (abs.
 desc.)
Pupa corticaria Pf. (Symb.) = *P.*
contracta.
Pupa curvidens Gld. = *P. pentodon*.
 211. *P. decora* Gld., Pf.
Vertigo decora Ad. Gen. abs. desc.)
Pupa deltostoma Charp. = *P. con-*
tracta.
Pupa detrita Shull., &c. = *P. in-*
cana.
Pupa gibbosa Chemn. = *P. rupicola*.
 212. *P. Hoppii* Möll., Tros., Chemn.,
 Pf.
Pupa Steenbuchii Beck, teste Mörch.
 213. *P. incana* Binn., Pf.
Pupa detrita Shutt., Pf., (olim.)
 " *maritima* γ Pf. (olim.)
 " *maritima* γ Gld. in Terr. Möll.
- var. *fasciata*.
Pupa maritima Gld. = *P. incana*.
P. maritima γ , Pf. = *P. incana*.
P. minuta Pf. = *P. rupicola*.
214. *P. modica* Gld., Pf.
P. muscorum β . Pf. = *P. badia*.
215. *P. pentodon* (*Vertigo*) Say.
Pupa pentodon Gld., DeK., Chemn.,
 Pf., Binn.
Pupa Tappaniana Ad., Pf., (olim.)
P. curvidens Gld., (olim.)
216. *P. placida* Say.
 = *Bulimus marginatus* Say, teste
 DeK., Gld., (olim.)
 = *Bulimus obscurus* Müll., teste Gld.
 DeK., Pf.
Pupa procera Gld., &c. = *P. rupi-*
cola.
217. *P. rupicola* (*Carychium*) Say.
Pupa rupicola Gld., DeK., Pf., Binn.
 nec Pf. Symb.
Pupa procera Gld., Chemn., Pf.,
 (olim.)
Pupa carinata Gld., (olim.) Pf.
Vertigo rupicola Binn.
 " *minuta* Ad., Gen ?
Pupa gibbosa Chemn. ?
 " *minuta* Pf.
P. rupicola Pf., (Symb.) = *P. armi-*
fera.
P. Steenbuchii Beck., v. *P. Hoppii*.
P. Tappaniana Ad., &c., = *P. pen-*
todon.
218. *P. variolosa* Gld., Pf.
Species exclusæ.
P. albilabris Ad. = *Bul. margina-*
tus.
P. costulata Mighels = *Bul. harpa*.
P. exigua Say, &c. = *Carychium*.
P. fullax Say, &c. = *Bul. margina-*
tus.
P. Gouldii Binn., &c. = *Vertigo*.
P. milium Gld., &c. = *Vertigo*.
P. modesta Say, &c. = *Vertigo*
ovata.
P. ovata Gld., &c. = *Vertigo*.
P. ovulum Pf. = *Vertigo ovata*.
P. Parraiana Orb. = *Bul. margin-*
atus.
P. simplex Gld., &c. = *Vertigo*.
P. unicarinata Binn. = *Macrocer-*
amus pontificus.
 VERTIGO.
219. *V. Gouldii* Binn., Stimp. (abs.
 desc.)

- Pupa Gouldii* Binn., (olim), Gld., Chemn., Pf.
220. *V. milium* Gld., Stimp. (abs. desc.), Binn.
Pupa milium Gld., (olim), Ad., DeK., Chemn., Pf.
221. *V. ovata* Say, Stimp. (abs. desc.) Binn.
Pupa ovata Gld., Ad., DeK., Pf., Chemn.
Pupa modesta Say, Gld.
" *ovulum* Pf., (olim).
222. *V. simplex* Gld., Stimp. (abs. desc.) Binn.
P. simplex Gld., (olim), DeK., Pf.
Species exclusæ.
V. contracta Ad. Gen. = Pupa.
V. decora Ad. Gen. = Pupa.
V. minuta Ad. Gen., v. *Pupa rupicola*.
V. pentodon Say = Pupa.
V. rupicola Binn. = Pupa.
E Heliceis exclusæ.
Aplodon Raf.
Aplodon nodosum Raf.
Chimotrema Raf.
Chimotrema planiuscula Raf.
Hemiloma Raf.
Hemiloma avara Raf.
Mesodon Raf.
Mesodon maculatum Raf.
Mesomphix Raf.
Odomphium Raf.
Odostomia Say = Pupa.
" *corticaria* Say = Pupa.
Odotropis Raf.
Omphalina Raf.
" *cuprea* Raf. v. *Helix fulignosa*.
Partula Otaheitanica Fer.
Stenostoma Raf.
Stenotrema Raf.
" *convexa* Raf.
Toxostoma Raf.
Toxostoma globularis Raf.
Toxotrema Raf.
Toxotrema globularis Raf.
Toxotrema complanata Raf.
Triodopsis Raf.
Trophodon Raf.
Xolotrema Raf.
" *lunula* Raf.
" *triodopsis* Raf.
- CYLINDRELLA.
223. *C. Goldfussi* Menke, Phil., Pf.
224. *C. jejuna* Gld., Pf.
C. lactaria Binney = *C. Poeyana* Orb.
225. *C. Poeyana* Orb., Pf.
C. lactaria Binn., (excl. desc. et syn.) nec Gld.
226. *C. Rømeri* Pf., Rømer.
Var. β .
Species exclusæ.
C. pontifica Gld. = *Macroceramus*.
- FAMILIA AURICULACEA.
Sub-familia MELAMPEA.
MELAMPUS.
227. *M. bidentatus* Say, Rus., Pf., (excl. *M. borealis*).
M. biplicatus Pf.
M. corneus Stimp., (abs. desc.)
M. Jaumei Pf.
Auricula buplicata Desh.
" *cornea* Desh.
" *bidentata* Gld., DeK., Chemn.
non *Auricula bidens* (Say), Pot. et Mich.
Auricula Jaumei Mittre.
Var. *lineatus* Say.
Melampus bidentatus β . Pf.
Auricula bidentata var. α . DeK.
M. biplicatus Pf. = *M. bidentatus*.
228. *M. cingulatus* Pf., Shutt.
Auricula cingulata Pf. (olim), Chemn.
" *oliva* Orb.
" *stenostoma* Küst. teste Pf.
229. *M. coffea* (*Voluta*) Linn., Schrö. Gmel., Dill.
Bulla coffea Linn.
Voluta minuta Gmel., Dill.
Auricula midæ parva &c., Martini?
Ellobium Barbadosense Boelten?
Bulimus coniformis Brug.
Melampus coniformis Montf., Lowe, C. B. Ad., Shutt.
" *fusca* Mörch. (teste Pf.)
" *coffea* Mörch. (teste Pf.)
Melampa minuta Pf., Schw.
Tornatelle coniforme Blain.
Auricula coniformis Fer., Lam., Pot. et Mich., Rve., Sowb. Chemn.
Auricula ovula Orb.
Conovulus coniformis Lam., Anton., Woodw.
M. coffeus Beck., abs. desc.

- M. coffea* Gray.
M. obliquus Say?
 Var. β ?
Melampus coniformis Mont., &c.
 = *M. coffea*.
M. corneus Stimp. = *M. bidentatus*.
 230. *M. Floridianus* (*Auricula*)
 Shutt.
M. Floridianus Pf.
M. fusca Mörch. = *M. coffea*.
M. Jaumei Pf. = *M. bidentatus*.
M. nitens Shutt. = *M. pusillus*.
 231. *M. obliquus* Say, Pf.
Auricula obliqua DeK., Conf. *M.*
coffea.
Melampus ovulum Lowe = *Melampus*
pusillus.
 232. *M. pusillus* (*Voluta*) Gmel.,
 Dill., Wood.
Voluta n. 108, Sch.
Favanne t. 68, f. H. 4.
Auricula midæ parva &c., Mart. et
 Chemn.
Voluta triplicata Don., Mont., Dill.,
 Wood.
Bulimius ovulus Brug.
Melampus ovulum Schw.
Conovula ovula Fer., Pot. et Mich.
Auricula nitens Lam., Chemn.
 " *pusilla* Desh., Petit.
 " *leucodonta* Nuttall., MSS.
 teste H. and A. Ad.
Conovulus nitens Voigt.
 " *pusillus* Anton.
Melampus ovulum Lowe.
 " *nitens* Shutt.
Pythia ovulum Beck, (*abs. desc.*)
 teste Pf.
P. triplicata Beck, (*abs. desc.*) teste
 Pf.
Tralia pusilla Ad. Gen.
 " *ovulum* Mörch. (*abs. desc.*)
 test Pf.
Species exclusæ.
Melampus borealis Conrad = *Alexia*
myosotis.
Melampus denticulatus Stimp. = *Alexia*
myosotis.
 Sub-familia AURICULEA.
 AURICULA.
Species exclusæ.
Auricula bidentata Gld., &c. = *Mel-*
ampus.
A. bispicata Desh. = *Melampus bi-*
dentatus.

- A. cingulata* Pf., &c. = *Melampus*.
A. coniformis Fer. = *Melampus coffea*.
A. cornea Desh. = *Melampus bidentatus*.
A. denticulata Gld., DeK. = *Alexia myosotis*.
A. Floridianus Shutt. = *Melampus*.
A. Joumei Mitre. = *Melampus bidentatus*.
A. nitens Lam. = *Melampus pusillus*.
A. obliqua DeK. = *Melampus*.
A. oliva Orb. = *Melampus cingulatus*.
A. pusilla Desh. = *Melampus*.
A. Sayii Kuster. = *Leuconia*.
A. stenostoma Kuster. = *Melampus cingulatus*.

ALEXIA.

233. *A. myosotis* (*Auricula*) Drap.
 &c.
Alexia myosotis Pf.
Auricula denticulata Gld., DeK.,
 nec Mont.
Melampus denticulatus Stimp., (*abs.*
desc.)
M. borealis Con.

BLAUNERIA.

234. *B. pellucida* Pf.
Achatina? pellucida Pf., olim.
Achatina " Gld.
Tornatellina Cubensis Pf. olim.;
 Chemn.
Odostomia? Cubensis Poey.

LEUCONIA.

235. *L? Sayii* (*Auricula*.) Küst.
Leuconia? Sayii Pf.
An Alexia myosotis?

CARYCHIUM.

236. *C. exiguum* (*Pupa?*) Say.
Carychium exiguum Pf., Chemn.,
 Stimp., Gld. Frau., Bourg.
C. exile H. C. Lea, Tros.
C. existelium Bourg?
C. euphæum Bourg?
Bulimus exiguus Binn.
Pupa exigua Gld., Ad., DeK.
Pupa exigua (*abs. desc.*) Kirt., &c.
 Script. Am.
Carychium exile H. C. Lea = *Car.*
exiguum?
C. existelium Bourg. = *Car. exiguum?*
C. euphæum Bourg. = *Car. exiguum?*

Species exclusæ.

- Carichium*? *armigera* Say = Pupa.
 " *corticaria* Fer. = Pupa.
 " *contracta* Say = Pupa.
 " *rupicola* Say = Pupa.

FAMILIA ACICULACEA.

TRUNCATELLA.

237. *T. bilabiata* Pf. Küst.
 238. *T. Caribæensis* Sowb. mss.,
Rve., Pf., Küst.
T. variabilis Pf., olim, abs. desc.
T. Gouldii C. B. Ads. abs. desc.,
 Bronn.
T. Geurinii Parr. abs. desc., nec
 Villa.
T. succinea C. B. Ads.
T. Caribæensis v. *T. subcylindrica*,
T. Gouldii Ads. = *T. Caribæensis*.
T. Guerinii Parr. = *T. Caribæensis*.
 239. *T. pulchella* Pf., Shutt., Küst.,
 Ads. Gen.
 240. *T. subcylindrica* Gray,
 Shutt., Pf., Orb., (exc. pars syn.)
Helix subcylindrica Pult., Mont.
T. truncatula Lowe?
T. Caribæensis Pf., olim, ex parte,
 Küst. ex parte.
T. succinea Ads. = *T. Caribæensis*.
T. truncatula Lowe? v. *T. subcylindrica*.
T. variabilis Pf. = *T. Caribæensis*.

FAMILIA CYCLOSTOMACEA.

Sub-familia CISTULEA.

CHONDROPOMA.

- C. crenulatum* Pf. = *C. dentatum*.
 241. *C. dentatum* (*Cyclostoma*) Say.
Cyclostoma dentatum DeK., Binn.
 " *lineolatum* Anton. teste Pf.
 " *Auberianum* Orb.?
 " *lunulatum* Mörch. teste Pf.
 " *crenulatum* Pf., (olim),
 Chemn. nec Fer.
Chondropoma crenulatum Pf., (olim).
 " *dentatum* Pf., Gr. et Pf.
Cyclostomacea exclusa.
Cyclostoma Auberianum Orb. v.

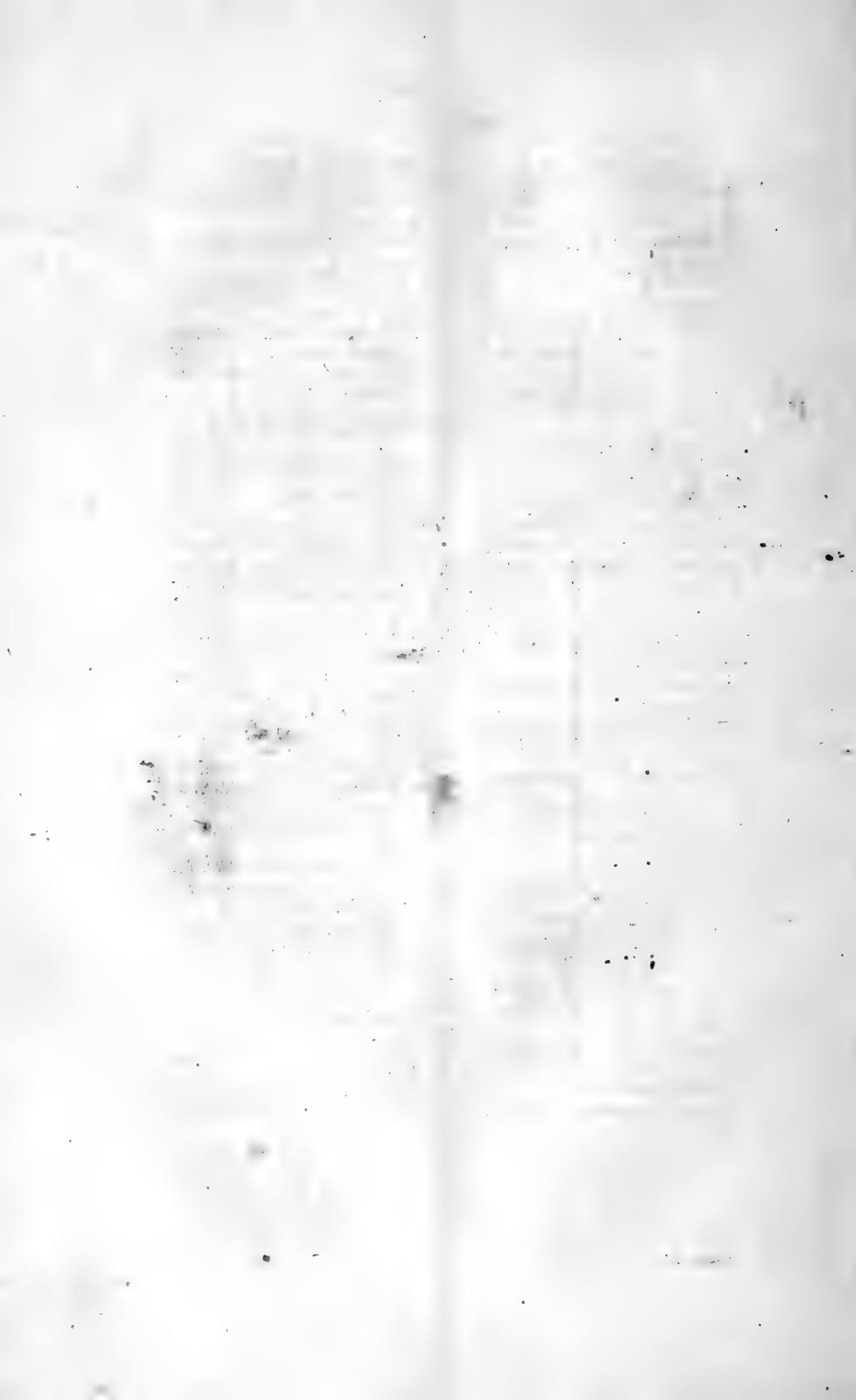
Chondropoma dentatum.

- C. Cincinnatensis* Lea = *Amnicola*.
C. crenulatum Pf., Ch. = *Chondropoma dentatum*.
C. dentatum Say, &c. = *Chondropoma*.
C. lapidaria Say = *Amnicola*.
C. lineolatum Anton. = *Chondropoma dentatum*.
C. lunulatum Mörch. = *Chondropoma dentatum*.
C. marginalis Kirt. = *Bul. marginatus*.
C. marginata Say, &c. = *Bulimus*.
C. tricarinata Say = *Valvata*.

FAMILIA HELICINACEA.

HELICINA.

- H. ambeliana* Sowb. = *H. tropica*.
H. castanea Gld. = *H. orbiculata*.
 242. *H. chrysocheila* Binn., Pf.
 243. *H. Hanleyana* Pf., Ch., Gr. et
 Pf.
 244. *H. occulta* Say, DeK., Ch.,
 Chenu., Binn., Pf., Gr. et Pf.
 245. *H. orbiculata* Say, DeK.,
 Chenu., Ch., Blw., Binn., (pars)
 Gld., (excl. *H. rubella*), Pf., (excl.
H. rubella Green), Gr. et Pf., non
 Sowb.
Oligyra orbiculata Say, olim.
 junior *Helicina vestita* Guild., Sowb.,
 Gr. et Pf.
 junior *Helicina castanea* Guild.,
 Sowb.?
 246. *H. subglobulosa* Poey, Pf.
 247. *H. tropica* Pf., Ch., Tros., (teste
 Pf.), Gr. et Pf.
H. ambeliana Sowb., nec DeB.
H. orbiculata Binn., pars nec Say
H. vestita Guild. = *H. orbiculata*.
Species exclusæ.
H. fastigiata DeK. = *Helix fatigata*
 Say.
H. plicata DeK. = *Helix Hazardi*
 Bland.
Oligyra Say = *Helicina*.
O. orbiculata Say = *Helicina*.



(From the Proceedings of the Academy of Natural Sciences of Philadelphia, July, 1859.)

[Vol. xi. p. 188, 189.]

Notes on American Land Shells, No. 5.

BY W. G. BINNEY.

In the Catalogue of American Land Shells, published in the last volume of the Proceedings, a few species were accidentally omitted. These and some additional authorities are given below. Several newly detected species are also given.

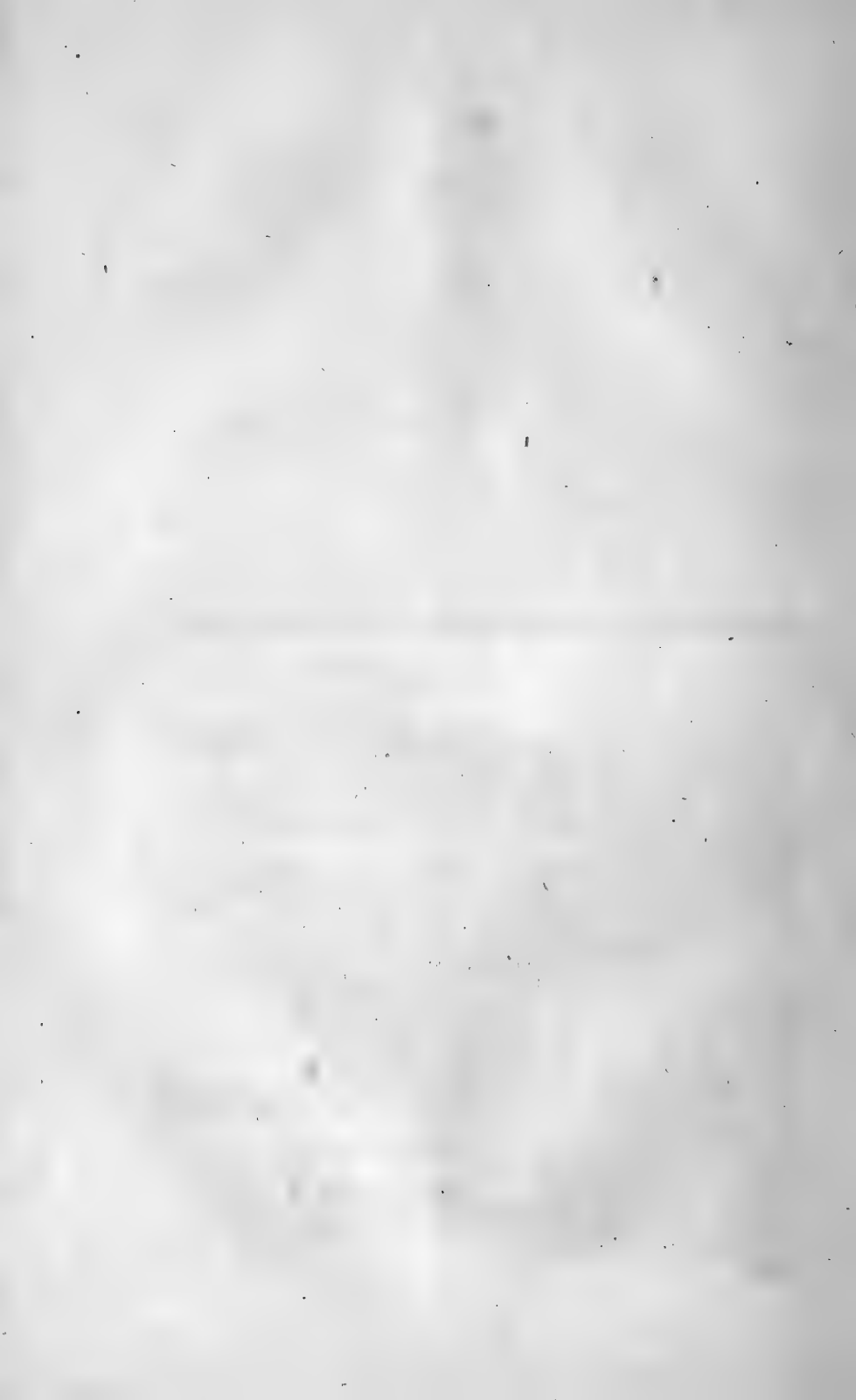
1. *A. foliolatus non foliatus*.
12. *H. Californiensis* Lea, Trosch.,
DeK., Binn.—nec Chemn., Rve.
- 13a. *H. cultellata* Thomson.
- 33a. *H. strigosa* Gld., Binn.,
Pfr.
- 33b. *H. Townsendiana* Lea,
Binn., DeK., Tros., Pfr., Gld.,
Chemn., Rve.
- 33c. *H. tudiculata* Binn., Pfr.
- 33d. *H. Vancouverensis*
Lea, Tros., DeK., Pfr., Binn.,
Chemn., Gld., Rve.
H. concava Binn. olim.
H. vellicata Forbes, Chemn.,
Rve., Pfr.
41. *B. sufflatus* Gld. in litt.
B. vesicalis Gld. olim.
- 48a. (in addenda) is syn. of 48.
- 49a. *T. bilineatus* Cart. (*Grat.*)
sp. mihi ignota.
- 55a. *L. lineatus* DeK.
sp. ined.—mihi ignota.
Limax—sp. excl.
Limax gracilis Grat.
Eumelus lividus Grat.
“ *nebulosus* Grat.
Philomycus dele *lividus*.
“ “ *nebulosus*.
“ adde.
P. oxyrus Raf., Gr. et Pf.
P. quadrilus Raf., Gr. et Pf.
dele
Oxyrus
“ *quadrilus*.
58. adde *V. Americana* Chemn.
68. *S. Texasiana* Pfr., Chem.
69. *S. obliqua* Pfr.
82. *H. auriculata* DeK.
83. *Stenotrema avara* Hart.
- 84a. *H. Berlanderiana* Mor.,
Desh. in Lam., Chemn., Pfr. in
vol. iii. nec vol. i., Rve., Binn.
H. pachyloma Mke., Pfr. ?
H. virginialis Pfr., Chemn.?
86. *H. bulbina* Pfr.
- 86a. *H. caduca* Pfr., Chemn.
Rve.
97. *H. dentifera* Pfr. vol. i. nec vol.
iii., nec Chemn.
After *H. diodonta* Say, read *H.*
dissidens Desh. = *H. concava*.
104. *H. Tennesseeensis* Tros.
130. *H. Mobiliana* Tros.
After 132 read *H. Leaii* Ward =
H. monodon.
133. *H. laevigata* Desh.
- 139a. *H. maxillata* Gld., Pfr.
- 140a. *H. milium* Morse.
141. *H. apex* Ad.
144. dele *H. monodon* var. γ. Pf.—legge
H. convexa var. γ. Pfr.
158. *H. dentifera* Pf. in vol. iii. nec.
vol. i., Chemn., nec. Binn.
After 161 *H. septemvolva* Say, &c.
= *H. cereolus* Muhl.
170. *H. Tamaulipasensis* Lea.
172. *H. thyroideus* Desh. in Fer.
176. dele *H. varians* Rve.
- 187a. *B. Gossei* Pfr., (*Röemer.*)
- 192a. *B. patriarcha* W. G. Binn.
193. Adde Rve.
195. *B. hortensis* Ad.!
213. *P. maritima* Gld., (nec γ.)
- 214a. *P. pellucida* Pfr., Chemn.
217. *P. rupicola* Chemn.
218. *Vertigo variolosa* Ad. Gen.
E. Heliceis exclusiva.
Triodopsis lunula Raf.
- 229a. *M. flavus* Gmel., Pfr.
Auricula Midæ &c. Mart. and
Chemn.
Voluta Schlr.
“ *flava* Gmel., Dillw.
“ *flammea* γ. Gmel.
Bulinus monile Brug.
Melampa monile Schw.
Conovulus monile Goldf.
“ *flavus* Anton.

[July, 1859.]

Auricula monile Fer., Lam., Chem.
 " *flava* Desh. in Lam.
 " *coniformis* Orb.
Melampus monile Lowe.

Melampus torosa Mörch.
 " *monilis* Shuttl.
 232a. *M. Redfieldi* Pfr.
 245. *H. vestita* Pfr.





From the Proceedings of the Academy of Natural Sciences of Philadelphia, 1860, p. 49, 50.

Mr. Binney remarked, that having prepared for the Smithsonian Institution a catalogue of the terrestrial and fluviatile Gasteropods of North America, he was able to present the following results:

Of the boreal regions but little is known. The only data we have are from Greenland. Both the fresh water and land species are peculiar to that country, excepting the European *Helix hortensis*, which has been introduced also in Canada and New England.

Of Mexico also but little is known. A few of its land species are found in Texas; they are, however, confined to that region, not extending farther north. The genera are more tropical than in the rest of the continent. Fluviatile species are very rare in Mexico, judging from the few data we have. The species appear different from those of the Atlantic region.

On the west coast the species of land shells are quite distinct from those of the Atlantic region, excepting *Bulimus zebra*; the genera, however, are the same, though fewer in number. Among the fluviatile species are found eleven species of Pulmonates, which also inhabit the Atlantic region.

In the Atlantic region are two or three species of land shells found in Europe, and a few fluviatile Pulmonates. The occurrence of the Asiatic species quoted from the United States may well be doubted.

The following table shows the facts presented by Mr. Binney. It is necessarily imperfect, owing to the small amount of material, the somewhat confused synonymy, &c.

Column 1 contains the species found in the Pacific region.

Column 2, those of the Atlantic region.

Column 3, those common to the Pacific and Atlantic region.

Column 4, those of Mexico, excepting the west coast.

Column 5, those common to Mexico and the Atlantic region.

Column 6, those of Greenland.

1860.]

Class GASTEROPODA.								
Order PECTINIBRANCHIATA.								
Suborder ROSTRIFERA.								
Family.	Subfamily.	Genus.	1	2	3	4	5	6 Total
AMPULLARIIDÆ		Ampullaria	0	4	0	5	0	9
CYCLOPHORIDÆ	CYCLOTINÆ	Cyclotus	0	0	0	1	0	1
	CYCLOPHORINÆ	Cyclophorus	0	0	0	2	0	2
	LICININÆ	Ctenopoma	0	1	0	0	0	1
	CYCLOSTOMINÆ	Tudora	0	0	0	1	0	1
		Cistula	0	0	0	1	0	1
		Chondropoma	0	1	0	2	0	3
HELICINIDÆ		Helicina	0	6	0	22	2	26
		Schazicheila	0	0	0	3	0	3
LITTORINIDÆ		Amnicola	2	18	0	0	0	20
TRUNCATELLIDÆ		Truncatella	1	4	0	1	1	5
MELANIDÆ		Melania	9	292	0	4	0	305
		Gyrotoma	0	10	0	0	0	10
		Leptoxis	3	54	0	0	0	57
		Jo	10	0	0	0	0	10
VIVIPARIDÆ		Viviparus	4	60	0	1	0	66
		Bithinia	0	0	0	0	1	1
VALVATIDÆ		Valvata	0	8	0	1	0	9
Order SCUTIBRANCHIATA.								
Suborder PSEUDOBRANCHIA.								
PROSERPINIDÆ		Ceres	0	0	0	2	0	2
Order PNEUMOBANCHIATA.								
Suborder GEOPHILA.								
TESTACELLIDÆ		Glandina	2	6	0	16	2	22
ARIONIDÆ		Arion	1	1*	0	0	0	2
HELICIDÆ		Tebennophorus	0	2	0	0	0	2
		Limax	1	3	0	0	0	4
		Vitrina	0	1	0	1	0	3
		Simpulopsis	0	0	0	3	0	3
		Succinea	4	15	0	2	0	22
		Helix	29	111†	0	31	6	167
		Bulimus	9	17||	0	26	4	48
		Spiraxis	0	0	0	17	0	17
		Orthalicus	1	2	1	3	1	4
		Macroceramus	0	1	0	0	0	1
		Achatina	1	3	0	5	0	9
		Pupa	0	12	0	0	0	13
		Vertigo	0	4	0	0	0	4
		Cylindrella	0	4	0	15	0	19
VERONICELLIDÆ		Veronicella	0	1	0	0	0	1
ONCHIDIIDÆ		Onchidium	1	0	0	0	0	1
Suborder LIMNOPHILA.								
AURICULIDÆ	MELAMPINÆ	Melampus	1	8	0	1	1	9
	AURICULINÆ	Alexia	0	1	0	0	0	1
		Blauneria	0	1	0	0	0	1
		Leuconia	0	1	0	0	0	1
		Carychium	0	1	0	0	0	1
LIMNÆIDÆ		Limnaea	13	45	5	4	0	61
		Pompholyx	1	0	0	0	0	1
		Physa	10	30	2	3	0	41
		Planorbis	11	31	3	4	0	44
		Ancylus	4	10	0	0	0	14
			117	770	11	177	17	1048

* Imported.

† Two species imported.

‡ Found also in the Atlantic region, and imported.

|| One species imported.

[Feb.

From the Proceedings of the Academy of Natural Sciences of Philadelphia, 1880, p. 150, et seq.

Notes on American Land Shells. No. 6.

BY W. G. BINNEY.

The Catalogue of the Terrestrial Mollusks of North America, commenced in the Proceedings of the Academy for November, 1858, and continued in the number for July, 1859, is here completed. The list is believed to contain all the species described as inhabiting Mexico. I have followed the systematic arrangement of Drs. Gray and Pfeiffer in grouping the genera, and the decisions of the latter in regard to the synonymy.

Many Central American species will undoubtedly be added to the list when their geographical range is better known. The species of the Pacific coast, included in the first section of the Catalogue, are omitted here, viz.: Nos. 3, 7, 8, 11, 23, 25, 35, 37, 39, 40, 41, 42, 43, 45, 46, 47.

For additional species, changes of nomenclature, &c., &c., of the section of the United States, see Boston Journal of Natural History, vol. vii., and the Remarks on North American Helicidæ, by Mr. T. Bland, in Annals of New York Lyceum of Natural History, vol. vi.

FAMILIA TESTACELLIDÆ.

GLANDINA.

- | | |
|--|--|
| <p>248. <i>G. candida</i> (<i>Achatina</i>) Shuttl.,
Pf. (olim.)
<i>Oleacina candida</i> Gr. et Pf., Pf.</p> <p>249. <i>G. Carminensis</i> Mor., Ads.
Gen.
<i>Achatina Carminensis</i> Desh. in
Fer., Pf. (olim.)
" <i>rosea</i> var. Rve. (46 b.)
<i>Oleacina Carminensis</i> Gr. et Pf.,
Pf.</p> <p>250. <i>G. conularis</i> (<i>Oleacina</i>) Pf.
<i>Achatina conularis</i> Pf. (olim.)</p> <p>251. <i>G. Cordovana</i> (<i>Oleacina</i>) Pf.
<i>Achatina Cordovana</i> Pf. (olim.)</p> | <p>252. <i>G. corneola</i> W. G. Binn. vid.
202.</p> <p>252a. <i>G. delicatula</i> (<i>Achatina</i>)
Shuttl., Pf. (olim.)
<i>Oleacina delicatula</i> Gr. et Pf., Pf.</p> <p>253. <i>G. Ghiesbreghti</i> (<i>Achatina</i>)
Pf. (olim.)
<i>Oleacina Ghiesbreghti</i> Pf.</p> <p>253a. <i>G. indusiata</i> Pf.</p> <p>254. <i>G. Isabellina</i> (<i>Achatina</i>) Pf.
(olim.), Rve.
<i>Oleacina Isabellina</i> Gr. et Pf., Pf.</p> <p>255. <i>G. Liebmanni</i> (<i>Achatina</i>) Pf.
(olim.), Chemn.
<i>Achatina striata</i> Rve. (19.)
<i>Oleacina Liebmanni</i> Gr. et Pf., Pf.</p> |
|--|--|

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256. *G. margaritacea* (*Achatina*) Pf. (olim.)
Oleacina margaritacea Pf.
- 256a. *G. monilifera* (*Achatina*) Pf. (olim.), Rve.
Oleacina monilifera Gr. et Pf., Pf.
257. *G. nana* (*Achatina*) Shuttl., Pf. (olim.)
Oleacina nana Gr. et Pf., Pf.
- 257a. *G. Orizabæ* (*Achatina*) Pf. (olim.)
Oleacina Orizabæ Pf.
258. *G. pulchella* (*Oleacina*) Pf.
259. *G. solidula* (*Achatina*) Pf. (olim.), Chemn., Rve., Desh. in Fer.
Polyphemus solidulus Pf. (olim.)
Glandina solidula Pf. (olim), Phil.
" *folliculus* Gld. (teste Pf.)
Oleacina solidula Gr. et Pf., Pf.
var. *Glandina paragramma* Mor.
260. *G. Sowerbyana* (*Achatina*) Pf. (olim), Rve.
Oleacina Sowerbyana Gr. et Pf., Pf.
261. *G. speciosa* (*Achatina*) Pf. (olim.)
Oleacina speciosa Pf.
262. *G. stigmatica* (*Achatina*) Shuttl., Pf. (olim.)
Oleacina stigmatica Gr. et Pf., Pf.
263. *G. Vanuxemensis* Lea, vid. 206.

FAMILIA HELICIDÆ.

VITRINA.

264. *V. Mexicana* Beck.

SIMPULOPSIS.

265. *S. Chiapensis* Pf.
266. *S. Cordovana* Pf.
267. *S. Salleana* Pf.

SUCCINEA.

268. *S. brevis* Dunk., Pf., Chemn.
269. *S. undulata* Say, Pf., Chemn.

HELIX.

270. *H. Ariadnæ* Pf., vid. 79.
271. *H. Berlandieriana* Mor. vid. 84a.
272. *H. bicincta* Pf., Chemn., Phil.
273. *H. bicruris* Pf.

274. *H. bilineata* Pf., Chemn., Rve. *H. zonites* Rve. 615.
275. *H. caduca* Pf., Rve., Chemn., =290?
276. *H. Chiapensis* Pf.
277. *H. coactiliata* Fer.
278. *H. contortuplicata* Beck.
279. *H. Cordovana* Pf.
280. *H. Couloni* Shuttl., Pf.
281. *H. flavescens* Wiegman, Pf., Chemn.
282. *H. fulvoidea* Mor., Pf.
283. *H. Ghiesbreghtii* Nyst., Pf. Rve., Chemn., Desh. in Fer.
284. *H. griseola* Pf. vid. 113.
285. *H. Guillardmodi* Shuttl., Pf., Chemn., Rve.
286. *H. helictomphala* Pf.
287. *H. Hindsii* Pf. vid. 117.
288. *H. Humboldtiana* Val., Pf., Chemn., Rve., Desh. in Fer., Phil.
H. Buffoniana Pf., Phil., Chemn., Fer., Rve., Binn.
H. badiocincta Wiegman.
289. *H. implicata* Beck.
290. *H. lucubrata* Say, Pf., nec. Binn. vid. 275.
291. *H. Mexicana* Koch., Chemn., Pf.
292. *H. Oajacensis* Koch., Chemn., Pf.
293. *H. plagioglossa* Pf.
294. *H. Salleana* Pf., Rve., Chemn.
295. *H. stolephora* Val., Pf., Chemn., Desh., Rve.
Helicella bupthalmus Fer.
Helix Lamarckiana β. Pf.
Nanina stolephora Pf., Gr. et Pf.
" *bicolor* Pf. (olim.)
296. *H. tenuicostata* Dunk., Chemn., Rve., Pf.
297. *H. Texasiana* Mor. vid. 170.
298. *H. trypanompala* Pf.
299. *H. Veracruzensis* Pf.
300. *H. zonites* Pf., Rve., (excl. 615.)
Nanina zonites Gr.

BULINUS.

301. *B. alternatus* Say, vid. 182.

[May.]

302. *B. attenuatus* Pf., Chemn.
 303. *B. auriflaui* Pf.
 304. *B. Cordovanus* Pf.
 305. *B. coriaceus* Pf.
 306. *B. costatostriatus* Pf.
 307. *B. Droueti* Pf.
 308. *B. Dunkeri* Pf., Rve.
 309. *B. emeus* Say, Pf.
 310. *B. fenestratus* Pf., Rve., Phil.
 311. *B. gnomon* Beck.
 312. *B. Gruneri* Pf., Rve., Chemn.
 313. *B. Hegewischi* Pf., Rve.
 314. *B. Humboldti* Pf., Rve.
 B. Mexicanus Val., nec Lam.
 var. β .
 var. γ . *Bulimus primularis* Rve.,
 Pf. (olim.)
 var. δ .
 var. ϵ .
 315. *B. livescens* Pf., Rve., Phil.
 316. *B. Mariæ Albers*, =183.
 317. *B. Martensi* Pf.
 318. *B. Mexicanus* Pf., Rve.,
 Deless., Desh. in Lam.
 Conchlogena vittata Fer.
 Orthalicus? *Mexicanus* Carp.
 318a. *B. patriarcha* W. G. Binn.
 319. *B. punctatissimus* Less.
 Rve., Pf., Chemn.
 Clausilia punctatissima Less.
 " *exesa* Pot. et Mich.
 Auricula fuscagula Lea.
 Pupa septemPLICATA Muhlf.
 Bulimus fuscagula Orb.
 " *septemPLICATUS* Pf. (olim.)
 " *dentatus* King?
 Cochlodrina exesa Fer.
 320. *B. rudis* Anton, Rve., Pf.
 321. *B. Schiedeanus* Pf. vid. 193.
 322. *B. serperastrus* Say, Pf.,
 Chemn.
 var. β . *Bulimus Liebmanni* Pf.
 " *Ziebmanni* Rve.
 " *serperastrus* var.
 Chemn.
 var. γ . *Bulimus nitelinus* Rve.
 323. *B. sulcosus* Pf., Phil., Rve.,
 B. hyematus Rve.
 324. *B. sulphureus* Pf.
 325. *B. truncatus* Pf., Rve., Phil.
 326. *B. varicosus* Pf., Chemn.
 SPIRAXIS.
 327. *S. acus* Shuttl., Pf.
 328. *S. auriculacea* Pf.
 329. *S. biconica* Pf.
 330. *S. catenata* Pf.
 331. *S. coniformis* Shuttl., Pf.
 332. *S. dubia* Pf.
 333. *S. euptycta* Pf.
 334. *S. irrigua* Shuttl., Pf.
 335. *S. lurida* Shuttl., Pf.
 336. *S. mitræformis* Shuttl., Pf.
 337. *S. Nicoleti* Shuttl., Pf.
 Achatina Nicoleti Chemn.
 338. *S. nigricans* Pf., Shuttl.
 Achatina nigricans Pf. olim, Rve.,
 Desh. in Fer.
 Glandina nigricans Pf. olim.
 339. *S. oblonga* Pf.
 340. *S. parvula* Pf.
 341. *S. Shuttleworthi* Pf.
 342. *S. streptostyla* Pf.
 Achatina streptostyla Pf. olim.
 Chemn.
 343. *S. turgidula* Pf.
 ORTHALICUS.
 343a. *O. Boucardi* Pf.
 344. *O. livens* Pf., Bk., Shuttl.
 345. *O. longus* Pf.
 Bulimus zebra β . Pf. (olim.)
 346. *O. undatus* Brug. vid. 196.
 ACHATINA.
 347. *A. ambigua* Pf.
 348. *A. Chiapensis* Pf.
 349. *A. Rangiana* Pf., Rve.
 350. *A. trochlea* Pf., Chemn.
 351. *A. trypanodes* Pf.
 CYLINDRELLA.
 352. *C. apiostoma* Pf.
 352a. *C. arctispira* Pf.
 353. *C. attenuata* Pf., Chemn.
 354. *C. Boucardi* Pf.
 355. *C. clava* Pf. Chemn.
 355a. *C. cretacea* Pf.

356. *C. decollata* Nyst. (Pupa), Pf., Chemn.
 357. *C. denticulata* Pf., Chemn.
 358. *C. filicosta* Shuttl., Pf., Chemn.
 359. *C. Ghiesbreghti* Pf., Chemn.
 360. *C. goniostoma* Pf., Chemn.
 360a. *C. grandis* Pf.
 361. *C. Liebmanni* Pf., Chemn., Phil.
 361a. *C. Mexicana* Cum.
 362. *C. Pfeifferi* Menke, Chemn., Phil.
 363. *C. Pilocerei* Pf., Chemn., Phil.
 364. *C. polygyra* Pf., Chemn.
 365. *C. teres* Menke, Pf., Chemn., Phil.
 365a. *C. splendida* Pf.
 366. *C. turris* Pf., Chemn.
- FAMILIA AURICULIDÆ.
 MELAMPUS.
 367. *M. coffea* Linn. vid. 229.
- FAMILIA TRUNCATELLIDÆ.
 TRUNCATELLA.
 368. *T. Caribæensis* Sowb. vid. 238.
- FAMILIA CYCLOPHORIDÆ.
 CYCLOTUS.
 369. *C. Dysoni* Pf.
Cyclostoma Dysoni Pf. (olim), Chemn.
Cyclophorus Dysoni Pf. (olim), Gr. et. Pf.
 CYCLOPHORUS.
 370. *C. Boucardi* Sallé, Pf.
 371. *C. Mexicanus* (*Cyclostoma*) Menke, Vgt., Phil., Sby., Chemn.
Cyclophorus Mexicanus Gr. et Pf., Pf. (olim.)
 TUDORA.
 372. *T. planospira* Pf.
Cyclostoma planospira Pf. (olim.)
 CISTULA.
 373. *C. trochlearis* Pf., Gr. et Pf.
Cyclostoma trochleare Pf. (olim), Chemn.
- Cyclostoma trochlea* Pf. (olim), neé Bens.
 CHONDROPOMA.
 374. *C. Cordovanum* Pf.
Cyclostoma Cordovanum Pf. (olim.)
 375. *C. truncatum* (*Cyclostoma*) Wieg., Rossm.
Chondropoma truncatum Pf., Gr. et Pf.
 FAMILIA HELICINIDÆ.
 HELICINA.
 376. *H. brevilabris* Pf.
 377. *H. Chiapensis* Pf.
 378. *H. chrysocheila* Binn. vid. 242.
 379. *H. chrysocheila* Shuttl., Pf. (nomen tr.)
 380. *H. cinctella* Shuttl., Pf.
 381. *H. concentrica* Pf., Gr. et Pf., Chemn.
 382. *H. Cordilleræ* Sallé, Pf.
 383. *H. delicatula* Shuttl., Pf.
 384. *H. elata* Shuttl., Pf.
 385. *H. flavida* Menke, Sowb., Chemn., Pf., Gr. et Pf.
H. Ambeliana Boissy, Pot. et Mich.
H. trossula Mor.
 386. *H. Ghiesbreghti* Pf.
 386a. *H. Heloisæ* Sallé.
 387. *H. Lindenii* Pf., Chemn., Gr. et Pf.
 388. *H. lirata* Pf., Gr. et Pf., Chemn.
 389. *H. merdigera* Sallé, Pf.
 390. *H. notata* Sallé, Pf.
 391. *H. Oweniana* Pf., Chemn., Gr. et Pf.
 392. *H. Sandozi* Shuttl., Pf.
 393. *H. sinuosa* Pf., Chemn., Gr. et Pf.
 394. *H. tenuis* Pf., Chemn., Gr. et Pf.
 395. *H. tropica* Pf. vid. 247.
 396. *H. turbinata* Wieg., Pf., Mke., Chemn., Gr. et Pf.
H. zephyrina var. Sowb.
 397. *H. zephyrina* Ducl., Sowb., Chemn., Orb., Gr. et Pf.
H. Ambeliana Sowb.
Olgyna zephyrina Mrs. Gray.

SCHAZICHEILA.

398. *S. alata* (*Helicina*) Mke., Gr.
et Pf.
Schazicheila alata Shuttl., Pf.,
Ad. Gen.
399. *S. Nicoleti* Shuttl., Pf.
400. *S. pannucea* Mor.
Helicina alata var.? Gr. et Pf.

FAMILIA PROSERPINIDÆ.

CERES.

401. *C. eolina* (*Carocolla*) Duclos.
Helicodonta eolina Fer.
Odontostomus eolinum Pfr. (olim.)
Proserpina eolina Pf. (olim.)
Ceres eolina Pf., Gr. et Pf.
402. *C. Salleana* Cum., Pf., Gr. et
Pf.

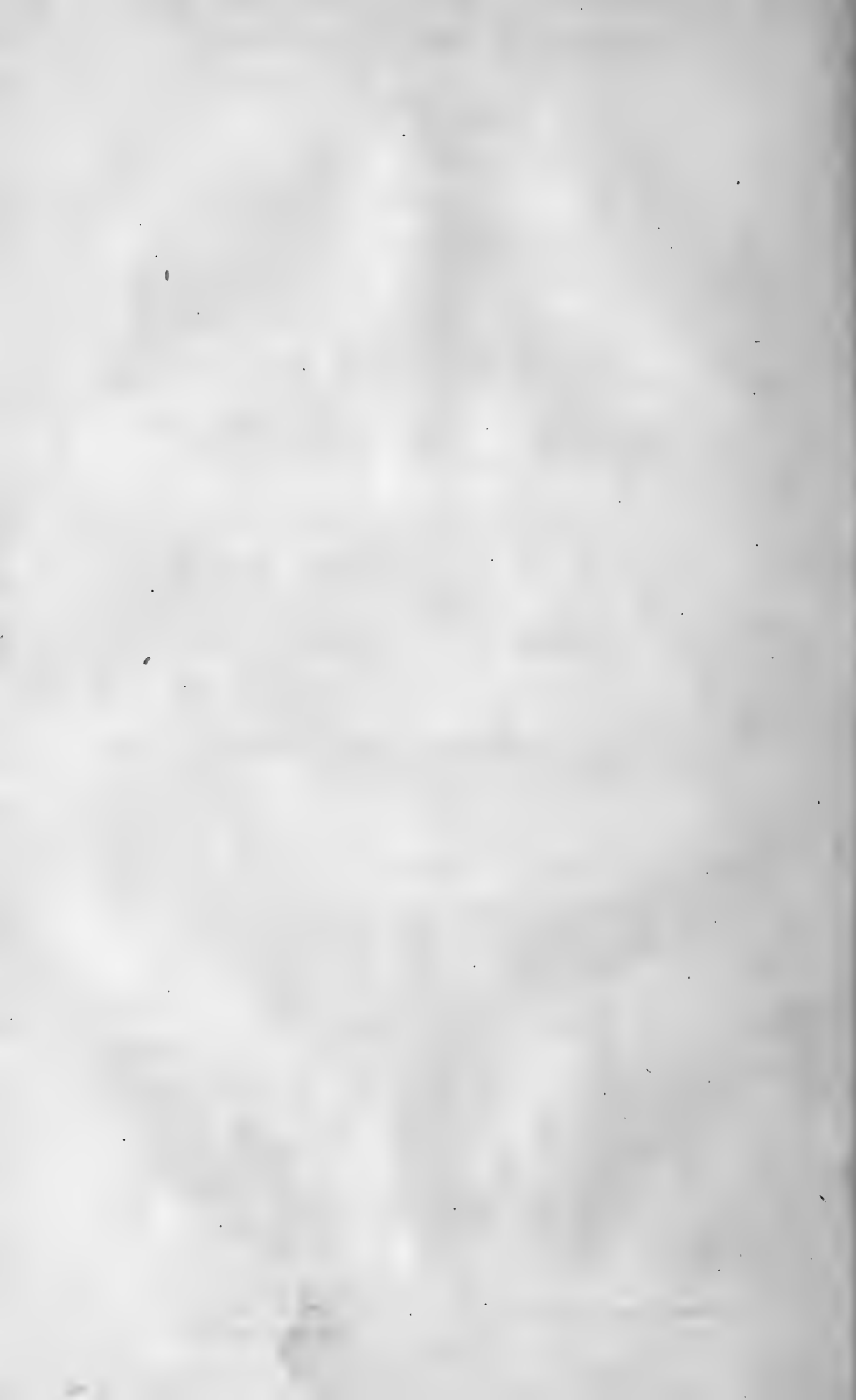
Descriptions of New Species of Pulmonata in the Collection of the
Smithsonian Institution.

BY W. G. BINNEY.

PEDIPES LIRATA. *T. imperforata*, globoso-conica, solida, liris regularibus spiraliter cincta, nitens, straminea; spira brevis, depressa, apice obtusâ; anfr. 3, superi brevi, ultimus 5-6 longitudinis subæquans; apertura semicircularis; paries aperturalis callo nitente induta, et plicâ elevatâ, crassâ, unâ et intrante armata; labium columellare callosum, dentibus 2 approximatis, crassis, acutis, munitum; perist. acutum, intus callo nitente in medio dentem formante munitum. Diam. maj. $2\frac{1}{2}$, long. $3\frac{1}{2}$; aperturæ long. $2\frac{1}{2}$, mill.

Ad promont. St. Lucas pœninsulæ Californiæ collegit J. Xantus (cum *Bulimo proteo* Brod., *B. pallidiori* Sowb. et *B. excelso* Gould.)

ONCHIDIUM CARPENTERI. Among the mollusca from the Straits of De Fuca, Mr. Carpenter has detected five specimens of a shellless mollusk, which evidently belong to the genus *Onchidium*. Being preserved in alcohol, it is difficult to obtain any more satisfactory specific characters than the following: The body is oblong, with its extremities circularly rounded; the upper surface is regularly arched; below, quite near the edge, the border of the mantle is readily distinguished, most of the under surface is occupied by the broad, distinct, locomotive disk; the body is uniformly smoke-colored; in size the individuals vary considerably, the length of the largest being 5, the extreme breadth 3 millimetres.



CHECK LIST

OF THE

SHELLS OF NORTH AMERICA.

TERRESTRIAL GASTEROPODA.

BY
W. G. BINNEY

LIST No. 1. The species of the Pacific coast from the extreme north to Mazatlan.

No. 2. The species of Eastern North America, from the boreal regions to the Rio Grande.

No. 3. The species found in Mexico exclusive of those included in No. 1 (viz. 3, 7, 8, 11, 23, 25, 35, 37, 39, 40, 41, 42, 43, 45, 46, 47)

SECTION I.—PACIFIC COAST.

PULMONOBRANCHIATA.

Testacellidæ.

1. *Glandina Albersi*, Pf.
2. *Glandina turris*, Pf.

Arionidæ.

3. *Arion foliolatus*, Gld.

Helicidæ.

4. *Limax columbianus*, Gld.
5. *Succinea cingulata*, Forbes.
6. *Succinea Nuttalliana*, Lea.
7. *Succinea oregonensis*, Lea.
8. *Succinea rusticana*, Gld.
9. *Helix acutedentata*, W. G. B.
10. *Helix anachoreta*, W. G. B.
11. *Helix areolata*, Pf.
12. *Helix areolata*, Pf.
var. β . Pf.
13. *Helix areolata*, Pf.
var. γ . Pf.

14. *Helix arrosa*, Gld.
15. *Helix aspersa*, Mull.?
16. *Helix californiensis*, Lea.
17. *Helix columbiana*, Lea.
18. *Helix cultellata*, Thomson.
19. *Helix devia*, Gld.
20. *Helix Dupetithouarsi*, Desh.
21. *Helix exarata*, Pf.
22. *Helix fidelis*, Gray.
23. *Helix germana*, Gld.
24. *Helix infumata*, Gld.
25. *Helix intercisa*, W. G. B.
26. *Helix Kelletti*, Forb.
27. *Helix levis*, Pf.
28. *Helix levis*, Pf.
var. β . Pf.
29. *Helix loricata*, Gld., Pf.
30. *Helix mazatlanica*, Pf.
31. *Helix mormonum*, Pf.

32. *Helix Newberryana*, *W. G. B.*
 33. *Helix Nickliniana*, *Lea.*
 34. *Helix pandoræ*, *Forb.*
 35. *Helix ramentosa*, *Gld.*
 36. *Helix redemita*, *W. G. B.*
 37. *Helix reticulata*, *Pf.*
 38. *Helix sportella*, *Gld.*
 39. *Helix strigosa*, *Gld.*
 40. *Helix Townsendiana*, *Lea.*
 41. *Helix tudiculata*, *Binn.*
 42. *Helix vancouverensis*, *Lea.*
 43. *Bulimus californicus*, *Rve.*
 44. *Bulimus chordatus*, *Pf.*
 45. *Bulimus excelsus*, *Gld.*
 46. *Bulimus Humboldti*, *Rve.*
 47. *Bulimus mexicanus*, *Lam.*
48. *Bulimus pallidior*, *Sowb.*
 49. *Bulimus proteus*, *Brod.*
 50. *Bulimus sufflatus*, *Gld.*
 51. *Bulimus Ziegleri*, *Pf.*
 52. *Orthalicus zebra*, *Mull.*
 53. *Achatina californica*, *Pf.*
 54. *Pupa Rowellii*, *Newc.*
Onchidiidæ.
 55. *Onchidium Carpenteri*,
W. G. B.
Auriculidæ.
 56. *Melampus olivaceus*, *Cpr.*
 57. *Pedipes lirata*, *W. G. B.*
Truncatellidæ.
 58. *Truncatella californica*, *Pf.*

SECTION II.—EASTERN NORTH AMERICA.

PULMONOBRANCHIATA.

Testacellidæ.

59. *Glandina bullata*, *Gld.*
 60. *Glandina corneola*, *W. G. B.*
 61. *Glandina parallela*, *W. G. B.*
 62. *Glandina texasiana*, *Pfr.*
 63. *Glandina truncata*, *Gmel.*
 64. *Glandina Vanuxemensis*, *Lea.*

Arionidæ.

65. *Arion empiricorum*, *Fer.?*
 66. *Arion hortensis*, *Fer.*

Helicidæ.

67. *Tebennophorus carolinensis*,
Bosc.
 68. *Tebennophorus dorsalis*, *Binn.*
 69. *Limax agrestis*, *Lin.*
 70. *Limax campestris*, *Binn.*
 71. *Limax flavus*, *Lin.*
 72. *Vitrina angelicæ*, *Beck.*
 73. *Vitrina limpida*, *Gld.*
 74. *Succinea aurea*, *Lea.*
 75. *Succinea avara*, *Say.*
 76. *Succinea avara*, *Say.*
var. major.
 77. *Succinea campestris*, *Say.*
 78. *Succinea concordialis*, *Gld.*
 79. *Succinea effusa*, *Shutt.*
 80. *Succinea groenlandica*, *Beck.*
 81. *Succinea Haydeni*, *W. G. B.*
 82. *Succinea Haydeni*, *W. G. B.*
var. minor.
 83. *Succinea inflata*, *Lea.*
 84. *Succinea lineata*, *W. G. B.*
 85. *Succinea luteola*, *Gld.*

86. *Succinea obliqua*, *Say.*
 87. *Succinea ovalis*, *Gld. non Say.*
 88. *Succinea retusa*, *Lea.*
 89. *Succinea Salleana*, *Pf.*
 90. *Succinea Totteniana*, *Lea.*
 91. *Succinea vermeta*, *Say.*
 92. *Helix albolabris*, *Say.*
 93. *Helix albolabris*, *Say.*
var. dentata.
 94. *Helix alternata*, *Say.*
 95. *Helix appressa*, *Say.*
 96. *Helix appressa*, *Say.*
var. a.
 97. *Helix arborea*, *Say.*
 98. *Helix ariadnæ*, *Pf.*
 99. *Helix aspersa*, *Müll.*
 100. *Helix asteriscus*, *Morse.*
 101. *Helix auriculata*, *Say.*
 102. *Helix auriformis*, *Bland.*
 103. *Helix avara*, *Say.*
 104. *Helix barbigera*, *Redf.*
 105. *Helix Berlandieriana*, *Mor.*
 106. *Helix bucculenta*, *Gld.*
 107. *Helix bucculenta*, *Gld.*
var. minor.
 108. *Helix bulbina*, *Desh.*
 109. *Helix caduca*, *Pf.*
 110. *Helix capsella*, *Gld.*
 111. *Helix Carpenteriana*, *Bland.*
 112. *Helix cellaria*, *Mull.*
 113. *Helix cereolus*, *Muhl.*
 114. *Helix chersina*, *Say.*
 115. *Helix Christyi*, *Bland.*
 116. *Helix Clarkii*, *Lea.*

117. *Helix clausa*, Say.
118. *Helix concava*, Say.
119. *Helix Cooperi*, W. G. B.
120. *Helix cumberlandiana*, Lea.
121. *Helix demissa*, Binn.
122. *Helix dentifera*, Binn.
123. *Helix divesta*, Gld.
124. *Helix Dorfeuilliana*, Lea.
125. *Helix Edgariana*, Lea.
126. *Helix Edwardsi*, Bld.
127. *Helix egena*, Say.
128. *Helix electrina*, Gld.
129. *Helix elevata*, Say.
130. *Helix Elliotti*, Redf.
131. *Helix espiloca*, Bland.
132. *Helix exigua*, Stm.
133. *Helix exoleta*, Binn.
134. *Helix Fabricii*, Beck.
135. *Helix fallax*, Say.
136. *Helix fatigiata*, Say.
137. *Helix friabilis*, W. G. B.
138. *Helix fuliginosa*, Binn.
139. *Helix griseola*, Pf.
140. *Helix gularis*, Say.
141. *Helix gularis*, Say.
var. *umbilicata*.
142. *Helix Gundlachi*, Pf.
143. *Helix Hazardi*, Bland.
144. *Helix Hindsii*, Pf.
145. *Helix hippocrepis*, Pf.
146. *Helix hirsuta*, Say.
147. *Helix hispida*, Linn.
148. *Helix hopetonensis*, Shut.
149. *Helix hortensis*, Mull.
150. *Helix incrustata*, Poey.
151. *Helix indentata*, Say.
152. *Helix indentata*, Say.
var. *umbilicata*.
153. *Helix inflecta*, Say.
154. *Helix inornata*, Say.
155. *Helix interna*, Say.
156. *Helix interna*, Say.
var. *albina*.
157. *Helix intertexta*, Binn.
158. *Helix intertexta*, Binn.
var. *carinata*.
159. *Helix introferens*, Bland.
160. *Helix jejuna*, Say.
161. *Helix kopnodes*, W. G. B.
162. *Helix labyrinthica*, Say.
163. *Helix lævigata*, Pf.
164. *Helix lasmodon*, Phill.
165. *Helix leporina*, Gld.
166. *Helix ligera*, Say.
167. *Helix limatula*, Ward.
168. *Helix lineata*, Say.
169. *Helix major*, Binn.
170. *Helix maxillata*, Gld.
171. *Helix mllium*, Morse.
172. *Helix minuscula*, Binn.
173. *Helix minutissima*, Lea.
174. *Helix Mitchelliana*, Lea.
175. *Helix monodon*, Rack.
176. *Helix monodon*, Rack.
var. 1. *Helix fraterna*, Say.
177. *Helix monodon*, Rack.
var. 2. *Helix Leaii*, Ward.
178. *Helix Mooreana*, W. G. B.
179. *Helix mordax*, Shutt.
180. *Helix multidentata*, Binn.
181. *Helix multilineata*, Say.
182. *Helix multilineata*, Say.
var. *albina*.
183. *Helix multilineata*, Say.
var. *rufa*, unicolor.
184. *Helix nitida*, Mull.
185. *Helix obstricta*, Say.
186. *Helix oppilata*, Mor.
187. *Helix Ottonis*, Pf.
188. *Helix palliata*, Say.
189. *Helix palliata*, Say.
var. *carolinensis*.
190. *Helix pennsylvanica*, Green.
191. *Helix perspectiva*, Say
192. *Helix Postelliana*, Bld.
183. *Helix profunda*, Say.
194. *Helix pulchella*, Müll.
195. *Helix pulchella*, Müll.
var. *costata*.
196. *Helix pustula*, Fer.
197. *Helix pustuloides*, Bld.
198. *Helix Roemeri*, Pf.
199. *Helix Rugeli*, Shutt.
200. *Helix Sayii*, Binn.
201. *Helix sculptilis*, Bld.
202. *Helix septemvolva*, Say.
203. *Helix solitaria*, Say.
204. *Helix spinosa*, Lea.
205. *Helix Steenstrupii*, Mörch.
206. *Helix stenotrema*, Fer.
207. *Helix striatella*, Anth.
208. *Helix subplana*, Binn.
209. *Helix suppressa*, Say.
210. *Helix tenuistriata*, Binn.
211. *Helix texasiana*, Mor.
212. *Helix texasiana*, Mor.
var. β , Pf.
213. *Helix texasiana*, Mor.
var. .
214. *Helix tholus*, W. G. B.

215. *Helix thyroides*, Say.
 216. *Helix tridentata*, Say.
 217. *Helix Troostiana*, Lea.
 218. *Helix uvulifera*, Shutt.
 219. *Helix varians*, Menke.
 220. *Helix ventrosula*, Pf.
 221. *Helix vortex*, Pf.
 222. *Helix vultuosa*, Gld.
 223. *Helix Wheatleyi*, Bland.
 224. *Bulimus acicula*, Müller.
 225. *Bulimus alternatus*, Say.
 226. *Bulimus dealbatus*, Say.
 227. *Bulimus decollatus*, Lin.
 228. *Bulimus Dormani*, W. G. B.
 229. *Bulimus floridanus*, Pf.
 230. *Bulimus Gossei*, Pf.
 231. *Bulimus gracillimus*, Pf.
 232. *Bulimus harpa*, Say.
 233. *Bulimus marginatus*, Say.
 234. *Bulimus Mariæ*, Albers.
 235. *Bulimus modicus*, Gld.
 236. *Bulimus multilineatus*, Say.
 237. *Bulimus octona*, Ch.
 238. *Bulimus patriarcha*, W. G. B.
 239. *Bulimus Schiedeanus*, Pf.
 240. *Bulimus Schiedeanus*, Pf.
 var. *apice nigra*.
 241. *Bulimus serperastrus*, Say.
 242. *Bulimus subula*, Pf.
 243. *Orthalicus undatus*, Brug.
 244. *Orthalicus zebra*, Mull.
 245. *Macroceramus Kieneri*, Pf.
 246. *Achatina fasciata*, Müll.
 247. *Achatina fasciata*, Müll.
 var. 1. *Achatina crenata*, Sw.
 248. *Achatina fasciata*, Müll.
 var. 2. *Achatina solida*, Say.
 249. *Achatina lubrica*, Müll.
 250. *Achatina picta*, Rve.
 251. *Pupa armifera*, Say.
 252. *Pupa badia*, Ad.
 253. *Pupa contracta*, Say.
 254. *Pupa corticaria*, Say.
 255. *Pupa decora*, Gld.
 256. *Pupa Hoppii*, Möll.

257. *Pupa incana*, Binn.
 258. *Pupa pellucida*, Pf.
 259. *Pupa pentodon*, Say.
 260. *Pupa placida*, Say.
 261. *Pupa rupicola*, Say.
 262. *Pupa variolosa*, Gld.
 263. *Vertigo Gouldii*, Binn.
 264. *Vertigo milium*, Gld.
 265. *Vertigo ovata*, Say.
 266. *Vertigo simplex*, Gld.
 267. *Cylindrella Goldfussi*, Menke
 268. *Cylindrella jejuna*, Gld.
 269. *Cylindrella Poeyana*, Orb.
 270. *Cylindrella Rœmeri*, Pf.

Veronicellidæ.

271. *Veronicella floridana*, Binn.

Auriculidæ.

272. *Melampus bidentatus*, Say.
 273. *Melampus cingulatus*, Pf.
 274. *Melampus coffea*, Linn.
 275. *Melampus flavus*, Gmel.
 276. *Melampus floridanus*, Shutt.
 277. *Melampus obliquus*, Say.
 278. *Melampus pusillus*, Gmel.
 279. *Melampus Redfieldi*, Pf.
 280. *Alexia myosotis*, Drap.
 281. *Blauneria pellucida*, Pf.
 282. *Leuconia Sayii*, Küst.
 283. *Carychium exiguum*, Say.

Truncatellidæ.

284. *Truncatella bilabiata*, Pf.
 285. *Truncatella caribæensis*, Sowb
 286. *Truncatella pulchella*, Pf.
 287. *Truncatella subcylindrica*, Gr.

Cyclophoridæ.

288. *Ctenopoma rugulosum*, Pf.
 289. *Chondropoma dentatum*, Say.

Helicinidæ.

290. *Helicina chrysocheila*, Binn.
 291. *Helicina Hanleyana*, Pf.
 292. *Helicina occulta*, Say.
 293. *Helicina orbiculata*, Say.
 294. *Helicina subglobulosa*, Poey.
 295. *Helicina tropica*, Pf.

SECTION III.—MEXICO.

PULMONOBRANCHIATA.**Testacellidæ.**

296. *Glandina candida*, Shuttl.
 297. *Glandina carminensis*, Mor.
 298. *Glandina conularis*, Pf.
 299. *Glandina cordovana*, Pf.
 300. *Glandina corneola*, W. G. B.
 301. *Glandina delicatula*, Shuttl.
 302. *Glandina Ghiesbreghti*, Pf.
 303. *Glandina indusiata*, Pfr.
 304. *Glandina isabellina*, Pf.
 305. *Glandina Liebmanni*, Pf.
 306. *Glandina margaritacea*, Pf.
 307. *Glandina monilifera*, Pf.
 308. *Glandina nana*, Shuttl.
 309. *Glandina pulchella*, Pf.
 310. *Glandina orizabæ*, Pf.
 311. *Glandina solidula*, Pf.?
 312. *Glandina Sowerbyana*, Pf.
 313. *Glandina speciosa*, Pf.
 314. *Glandina stigmatica*, Shuttl.
 315. *Glandina Vanuxemensis*, Lea.

Helicidæ.

316. *Vitrina mexicana*, Beck.
 317. *Simpulopsis chiapensis*, Pf.
 318. *Simpulopsis cordovana*, Pf.
 319. *Simpulopsis Salleana*, Pf.
 320. *Succinea brevis*, Dunker.
 321. *Succinea undulata*, Say.
 322. *Helix ariadneæ*, Pf.
 323. *Helix Berlandieriana*, Mor.
 324. *Helix bicincta*, Pf.
 325. *Helix bicruris*, Pf.
 326. *Helix bilineata*, Pf.
 327. *Helix caduca*, Pf.
 328. *Helix chiapensis*, Pf.
 329. *Helix coactiliata*, Fer.
 330. *Helix contortuplicata*, Beck.
 331. *Helix cordovana*, Pf.
 332. *Helix Couloni*, Shuttl.
 333. *Helix flavescens*, Wiegmann.
 334. *Helix fulvoidea*, Mor.
 335. *Helix Ghiesbreghti*, Nyst.
 336. *Helix griseola*, Pf.
 337. *Helix Guillardmodi*, Shuttl.
 338. *Helix helictomphala*, Pf.
 339. *Helix Hindsii*, Pf.
 340. *Helix Humboldtiana*, Val.
 341. *Helix implicata*, Beck.

342. *Helix lucubrata*, Say.
 343. *Helix mexicana*, Koch.
 344. *Helix oajacensis*, Koch.
 345. *Helix plagioglossa*, Pf.
 346. *Helix Salleana*, Pf.
 347. *Helix stolephora*, Val.
 348. *Helix tenuicostata*, Dunk.
 349. *Helix texasiana*, Mor.
 350. *Helix trypanompala*, Pf.
 351. *Helix veracruzensis*, Pf.
 352. *Helix zonites*, Pf.
 353. *Bulimus alternatus*, Say.
 354. *Bulimus attenuatus*, Pf.
 355. *Bulimus aurifluus*, Pf.
 356. *Bulimus cordovanus*, Pf.
 357. *Bulimus coriaceus*, Pf.
 358. *Bulimus costatostriatus*, Pf.
 359. *Bulimus Droueti*, Pf.
 360. *Bulimus Dunkeri*, Pf.
 361. *Bulimus emeus*, Say.
 362. *Bulimus fenestratus*, Pf.
 363. *Bulimus gnomon*, Beck.
 364. *Bulimus Gruneri*, Pf.
 365. *Bulimus Hegewischi*, Pf.
 366. *Bulimus Humboldti*, Rve.
 367. *Bulimus livescens*, Pf.
 368. *Bulimus Mariæ*, Albers.
 369. *Bulimus Martensi*, Pf.
 370. *Bulimus mexicanus*, Lam.
 371. *Bulimus patriarcha*, W. G. Binn
 372. *Bulimus punctatissimus*, Less.
 373. *Bulimus rudis*, Anton.
 374. *Bulimus Schiedeanus*, Pf.
 375. *Bulimus serperastrus*, Say.
 376. *Bulimus sulcosus*, Pf.
 377. *Bulimus sulphureus*, Pf.
 378. *Bulimus truncatus*, Pf.
 379. *Bulimus varicosus*, Pf.
 380. *Spiraxis acus*, Shuttl.
 381. *Spiraxis auriculacea*, Pf.
 382. *Spiraxis biconica*, Pf.
 383. *Spiraxis catenata*, Pf.
 384. *Spiraxis coniformis*, Shuttl.
 385. *Spiraxis dubia*, Pf.
 386. *Spiraxis euptycta*, Pf.
 387. *Spiraxis irrigua*, Shuttl.
 388. *Spiraxis lurida*, Shuttl.
 389. *Spiraxis mitræformis*, Shuttl.
 390. *Spiraxis Nicoleti*, Shuttl.

391. *Spiraxis nigricans*, *Pf.*
 392. *Spiraxis oblonga*, *Pf.*
 393. *Spiraxis parvula*, *Pf.*
 394. *Spiraxis Shuttleworthi*, *Pf.*
 395. *Spiraxis streptostyla*, *Pf.*
 396. *Spiraxis turgidula*, *Pf.*
 397. *Orthalicus Boucardi*, *Pf.*
 398. *Orthalicus livens*, *Pf.*
 399. *Orthalicus longus*, *Pf.*
 400. *Orthalicus undatus*, *Brug.*
 401. *Achatina ambigua*, *Pf.*
 402. *Achatina chiapensis*, *Pf.*
 403. *Achatina Rangiana*, *Pf.*
 404. *Achatina trochlea*, *Pf.*
 405. *Achatina trypanodes*, *Pf.*
 406. *Cylindrella apiostoma*, *Pf.*
 407. *Cylindrella arctospira*, *Pf.*
 408. *Cylindrella attenuata*, *Pf.*
 409. *Cylindrella Boucardi*, *Pf.*
 410. *Cylindrella clava*, *Pf.*
 411. *Cylindrella cretacea*, *Pf.*
 412. *Cylindrella decollata*, *Nyst.*
 413. *Cylindrella denticulata*, *Pf.*
 414. *Cylindrella filicosta*, *Shuttl.*
 415. *Cylindrella Ghiesbreghti*, *Pf.*
 416. *Cylindrella goniostoma*, *Pf.*
 417. *Cylindrella grandis*, *Pf.*
 418. *Cylindrella Liebmanni*, *Pf.*
 419. *Cylindrella mexicana*, *Pf.*
 420. *Cylindrella Pfeifferi*, *Menke.*
 421. *Cylindrella Pilocerei*, *Pf.*
 422. *Cylindrella polygyra*, *Pf.*
 423. *Cylindrella splendida*, *Pf.*
 424. *Cylindrella teres*, *Menke.*
 425. *Cylindrella turris*, *Pf.*
- Auriculidæ.**
 426. *Melampus coffea*, *Linn.*
- Truncatellidæ.**
 427. *Truncatella caribæensis*, *Sowb.*

Cyclophoridæ.

428. *Cyclotus Dysoni*, *Pf.*
 429. *Cyclophorus Boucardi*, *Sallé.*
 430. *Cyclophorus mexicanus*, *M.*
 431. *Tudora planospira*, *Pf.*
 432. *Cistula trochlearis*, *Pf.*
 433. *Chondropoma cordovanum*, *P.*
 434. *Chondropoma truncatum*, *W.*

Helicinidæ.

435. *Helicina brevilabris*, *Pf.*
 436. *Helicina chiapensis*, *Pf.*
 437. *Helicina chrysocheila*, *Binn.*
 438. *Helicina chrysocheila*, *Shuttl.*
 439. *Helicina cinctella*, *Shuttl.*
 440. *Helicina concentrica*, *Pf.*
 441. *Helicina cordilleræ*, *Sallé.*
 442. *Helicina delicatula*, *Shuttl.*
 443. *Helicina elata*, *Shuttl.*
 444. *Helicina flavida*, *Menke.*
 445. *Helicina Ghiesbreghti*, *Pf.*
 446. *Helicina Heloisæ*, *Sallé.*
 447. *Helicina Lindeni*, *Pf.*
 448. *Helicina lirata*, *Pf.*
 449. *Helicina merdigera*, *Sallé.*
 450. *Helicina notata*, *Sallé.*
 451. *Helicina Oweniana*, *Pf.*
 452. *Helicina Sandozi*, *Shuttl.*
 453. *Helicina sinuosa*, *Pf.*
 454. *Helicina tenuis*, *Pf.*
 455. *Helicina tropica*, *Pf.*
 456. *Helicina turbinata*, *Wieg.*
 457. *Helicina zephyrina*, *Ducl.*
 458. *Schasicheila alata*, *Mke.*
 459. *Schasicheila Nicoleti*, *Shuttl.*
 460. *Schasicheila pannucea*, *Mor.*

Proserpinidæ.

461. *Ceres eolina*, *Ducl.*
 462. *Ceres Salleana*, *Gray.*

CHECK LIST

OF THE

SHELLS OF NORTH AMERICA.

FLUVIATILE GASTEROPODA.

BY
W. G. BINNEY.

THE species whose range is confined to Eastern North America are not indicated by any peculiar mark. The letter W. distinguishes those confined to the Pacific coast; the letters W. E. are affixed to the names of those found in both the Eastern and Western sections, while the Greenland and Mexican species are also respectively designated by the letters G. and M.

This list has been compiled from all American publications and the few European monographs treating of this branch of the Mollusca. I have preferred giving the name of many doubtful species rather than omit that of any which my own limited knowledge of the subject does not lead me to consider a synonym. The list, therefore, is not offered as a complete elimination of the synonymy, but rather as a temporary guide to the arrangement of this portion of the collection. It should not be quoted as authority.

PECTINIBRANCHIATA.

Melaniidæ.

- | | |
|--|---|
| 1. <i>Melania abbreviata</i> , <i>Anth.</i> | 18. <i>Melania approximata</i> , <i>Hald.</i> |
| 2. <i>Melania abrupta</i> , <i>Lea.</i> | 19. <i>Melania arachnoidea</i> , <i>Anth.</i> |
| 3. <i>Melania abscida</i> , <i>Anth.</i> | 20. <i>Melania arctata</i> , <i>Lea.</i> |
| 4. <i>Melania acuta</i> , <i>Lea.</i> | 21. <i>Melania armigera</i> , <i>Say.</i> |
| 5. <i>Melania acuto-carinata</i> , <i>Lea.</i> | 22. <i>Melania assimilis</i> , <i>Lea.</i> |
| 6. <i>Melania adusta</i> , <i>Anth.</i> | 23. <i>Melania athleta</i> , <i>Anth.</i> |
| 7. <i>Melania æqualis</i> , <i>Hald.</i> | 24. <i>Melania auriculæformis</i> , <i>Lea.</i> |
| 8. <i>Melania alexandrensis</i> , <i>Lea.</i> | 25. <i>Melania auriscalpium</i> , <i>Menke.</i> |
| 9. <i>Melania altipeta</i> , <i>Anth.</i> | 26. <i>Melania Babylonica</i> , <i>Lea.</i> |
| 10. <i>Melania attilis</i> , <i>Lea.</i> | 27. <i>Melania baculum</i> , <i>Anth.</i> |
| 11. <i>Melania alveare</i> , <i>Conr.</i> | 28. <i>Melania basalis</i> , <i>Lea.</i> |
| 12. <i>Melania ambusta</i> , <i>Anth.</i> | 29. <i>Melania bella</i> , <i>Conr.</i> |
| 13. <i>Melania ampla</i> , <i>Anth.</i> | 30. <i>Melania bellacrenata</i> , <i>Hald.</i> |
| 14. <i>Melania angulata</i> , <i>Anth.</i> | 31. <i>Melania bicincta</i> , <i>Anth.</i> |
| 15. <i>Melania angulosa</i> , <i>Menke.</i> | 32. <i>Melania bicolorata</i> , <i>Anth.</i> |
| 16. <i>Melania angustispira</i> , <i>Anth.</i> | 33. <i>Melania bicostata</i> , <i>Anth.</i> |
| 17. <i>Melania annulifera</i> , <i>Conr.</i> | 34. <i>Melania bitæniata</i> , <i>Conr.</i> |
| | 35. <i>Melania bizonalis</i> , <i>DeKay.</i> |
| | 36. <i>Melania blanda</i> , <i>Lea.</i> |

37. *Melania Boykiniana*, *Lea*.
38. *Melania brevis*, *Lea*.
39. *Melania brevispira*, *Anth*.
40. *Melania Brumbyi*, *Lea*.
41. *Melania brunnea*, *Anth*.
42. *Melania Buddii*, *Lea*.
43. *Melania bulbosa*, *Gld. W*.
44. *Melania caliginosa*, *Lea*.
45. *Melania canaliculata*, *Say*.
46. *Melania cancellata*, *Say*.
47. *Melania carinata*, *Rav*.
48. *Melania carinifera*, *Lam*.
49. *Melania carino-costata*, *Lea*.
50. *Melania casta*, *Anth*.
51. *Melania castanea*, *Lea*.
52. *Melania catenaria*, *Say*.
53. *Melania catenoides*, *Lea*.
54. *Melania circinata*, *Lea*.
55. *Melania clara*, *Anth*.
56. *Melania Clarkii*, *Lea*.
57. *Melania clavæformis*, *Lea*.
58. *Melania cœlatura*, *Conr*.
59. *Melania cognata*, *Anth*.
60. *Melania columella*, *Lea*.
61. *Melania comma*, *Conr*.
62. *Melania compacta*, *Anth*.
63. *Melania concinna*, *Lea*.
64. *Melania congesta*, *Conr*.
65. *Melania conica*, *Say*.
66. *Melania consanguinea*, *Anth*.
67. *Melania coracina*, *Anth*.
68. *Melania corneola*, *Anth*.
69. *Melania coronilla*, *Anth*.
70. *Melania corpulenta*, *Anth*.
71. *Melania costata*, *Rav*.
72. *Melania costifera*, *Hald*.
73. *Melania costulata*, *Lea*.
74. *Melania crebri-costata*, *Lea*.
75. *Melania crebri-striata*, *Lea*.
76. *Melania crenatella*, *Lea*.
77. *Melania cristata*, *Anth*.
78. *Melania cubicoides*, *Anth*.
79. *Melania Curreyana*, *Lea*.
80. *Melania curta*, *Hald*.
81. *Melania curvata*, *Lea*.
82. *Melania curvilabris*, *Anth*.
83. *Melania cuspidata*, *Anth*.
84. *Melania cylindracea*, *Conr*.
85. *Melania decora*, *Lea*.
86. *Melania decorata*, *Anth*.
87. *Melania depygis*, *Say*.
88. *Melania Deshayesiana*, *Lea*.
89. *Melania densa*, *Anth*.
90. *Melania dislocata*, *Rav*.
91. *Melania dubiosa*, *Lea*.
92. *Melania Duttoniana*, *Lea*.
93. *Melania ebum*, *Lea*.
94. *Melania Edgariana*, *Lea*.
95. *Melania elata*, *Anth*.
96. *Melania elegantula*, *Anth*.
97. *Melania elevata*, *Say*.
98. *Melania eliminata*, *Anth*.
99. *Melania elongata*, *Lea*.
100. *Melania exarata*, *Menke*.
101. *Melania exarata*, *Lea*.
102. *Melania excavata*, *Anth*.
103. *Melania excurata*, *Conr*.
104. *Melania exigua*, *Conr. W*.
105. *Melania exilis*, *Hald*.
106. *Melania eximia*, *Anth*.
107. *Melania expansa*, *Lea*.
108. *Melania fastigiata*, *Anth*.
109. *Melania filum*, *Lea*.
110. *Melania Florentiana*, *Lea*.
111. *Melania Foremani*, *Lea*.
112. *Melania formosa*, *Conr*.
113. *Melania fuliginosa*, *Lea*.
114. *Melania funebris*, *Anth*.
115. *Melania furva*, *Lea*.
116. *Melania fuscata*, *Desh*.
117. *Melania fusiformis*, *Lea*.
118. *Melania fusco-cincta*, *Anth*.
119. *Melania gemma*, *DeKay*.
120. *Melania germana*, *Anth*.
121. *Melania gibbosa*, *Lea*.
122. *Melania gibbosa*, *Raf*.
123. *Melania glabra*, *Lea*.
124. *Melania glandula*, *Anth*.
125. *Melania glauca*, *Anth*.
126. *Melania globula*, *Lea*.
127. *Melania gracilior*, *Anth*.
128. *Melania gracilis*, *Lea*.
129. *Melania gracillima*, *Anth*.
130. *Melania gradata*, *Anth*.
131. *Melania grata*, *Anth*.
132. *Melania gravida*, *Anth*.
133. *Melania grisea*, *Anth*.
134. *Melania Haleiana*, *Lea*.
135. *Melania harpa*, *Lea*.
136. *Melania hastata*, *Anth*.
137. *Melania Haysiana*, *Lea*.
138. *Melania Hildrethiana*, *Lea*.
139. *Melania Holstonia*, *Lea*.
140. *Melania hybrida*, *Anth*.
141. *Melania Hydeii*, *Conr*.
142. *Melania imbricata*, *Anth*.
143. *Melania impressa*, *Lea*.
144. *Melania incrassata*, *Anth*.
145. *Melania inemta*, *Anth*.
146. *Melania inflata*, *Hald*.

147. *Melania inflata*, *Lea.*
148. *Melania infrafasciata*, *Anth.*
149. *Melania inornata*, *Anth.*
150. *Melania intersita*, *Hald.*
151. *Melania intertexta*, *Anth.*
152. *Melania iostoma*, *Anth.*
153. *Melania iota*, *Anth.*
154. *Melania Jayana*, *Lea.*
155. *Melania Kirtlandiana*, *Lea.*
156. *Melania læta*, *Jay.*
157. *Melania lævis*, *Lea.*
158. *Melania laqueata*, *Say.*
159. *Melania latitans*, *Anth.*
160. *Melania Lecontiana*, *Lea.*
161. *Melania Liebmanni*, *Phil.* **M.**
162. *Melania ligata*, *Menke.*
163. *Melania livescens*, *Menke.*
164. *Melania lugubris*, *Lea.*
165. *Melania marginata*, *Raf.*
166. *Melania Menkeana*, *Lea.* **W.**
167. *Melania modesta*, *Lea.*
168. *Melania monozonalis*, *Lea.*
169. *Melania multilineata*, *Say.*
170. *Melania napilla*, *Anth.*
171. *Melania nassula*, *Conr.*
172. *Melania nebulosa*, *Conr.*
173. *Melania neglecta*, *Anth.*
174. *Melania Newberryi*, *Lea.* **W.**
175. *Melania niagarensis*, *Lea.*
176. *Melania nigrocincta*, *Anth.*
177. *Melania nigrina*, *Lea.* **W.**
178. *Melania nitens*, *Lea.*
179. *Melania nobilis*, *Lea.*
180. *Melania nodulosa*, *Lea.*
181. *Melania nucleola*, *Anth.*
182. *Melania oblita*, *Lea.*
183. *Melania obtusa*, *Lea.*
184. *Melania occidentalis*, *Lea.*
185. *Melania occulta*, *Anth.*
186. *Melania Ocoensis*, *Lea.*
187. *Melania oliva*, *Lea.*
188. *Melania olivula*, *Conr.*
189. *Melania opaca*, *Anth.*
190. *Melania oppugnata*, *Lea.*
191. *Melania Ordiana*, *Lea.*
192. *Melania ovalis*, *Lea.*
193. *Melania ovoidea*, *Lea.*
194. *Melania ovularis*, *Menke.*
195. *Melania pagodiformis*, *Anth.*
196. *Melania pallescens*, *Lea.*
197. *Melania pallidula*, *Anth.*
198. *Melania paucicosta*, *Anth.*
199. *Melania perangulata*, *Conr.*
200. *Melania percarinata*, *Conr.*
201. *Melania perfusca*, *Lea.*
202. *Melania pernodosa*, *Lea.*
203. *Melania perstriata*, *Lea.*
204. *Melania pilula*, *Lea.*
205. *Melania picta*, *Lea.*
206. *Melania pinguis*, *Lea.*
207. *Melania planogyra*, *Anth.*
208. *Melania planospira*, *Anth.*
209. *Melania plebeius*, *Anth.*
210. *Melania plena*, *Anth.*
211. *Melania plicifera*, *Lea.* **W.**
212. *Melania pluristriata*, *Say.* **M.**
213. *Melania ponderosa*, *Anth.*
214. *Melania Postellii*, *Lea.*
215. *Melania Potosiensis*, *Lea.*
216. *Melania prasinata*, *Conr.*
217. *Melania producta*, *Lea.*
218. *Melania proscissa*, *Anth.*
219. *Melania proteus*, *Lea.*
220. *Melania proxima*, *Say.*
221. *Melania pulchella*, *Anth.*
222. *Melania pulcherrima*, *Anth.*
223. *Melania pumila*, *Lea.*
224. *Melania pupoidea*, *Anth.*
225. *Melania pyramidalis*, *Mor.* **M**
226. *Melania pyrenella*, *Conr.*
227. *Melania regularis*, *Lea.*
228. *Melania rhombica*, *Anth.*
229. *Melania rigida*, *Anth.*
230. *Melania robulina*, *Anth.*
231. *Melania robusta*, *Lea.*
232. *Melania rubida*, *Lea.* **M.**
233. *Melania rufescens*, *Lea.*
234. *Melania rufula*, *Hald.*
235. *Melania rugosa*, *Lea.*
236. *Melania Saffordii*, *Lea.*
237. *Melania Schiedeana*, *Phil.* **M**
238. *Melania sculptilis*, *Lea.*
239. *Melania Sellersiana*, *Lea.*
240. *Melania semicarinata*, *Say.*
241. *Melania semicostata*, *Conr.*
242. *Melania shastaensis*, *Lea.* **W.**
243. *Melania silicula*, *Gld.* **W**
244. *Melania simplex*, *Say.*
245. *Melania solida*, *Lea.*
246. *Melania sordida*, *Lea.*
247. *Melania spinalis*, *Lea.*
248. *Melania spurca*, *Lea.*
249. *Melania striatula*, *Lea.*
250. *Melania strigosa*, *Lea.*
251. *Melania stygia*, *Say.*
252. *Melania subangulata*, *Anth.*
253. *Melania subcylindracea*, *Lea*
254. *Melania subglobosa*, *Say.*
255. *Melania subsolida*, *Lea.*
256. *Melania substricta*, *Hald.*

257. *Melania subularis*, *Lea*.
 258. *Melania succinulata*, *Anth*.
 259. *Melania sulcosa*, *Lea*.
 260. *Melania symmetrica*, *Conr*.
 261. *Melania symmetrica*, *Hald*.
 262. *Melania tabulata*, *Anth*.
 263. *Melania tæniolata*, *Anth*.
 264. *Melania Taitiana*, *Lea*.
 265. *Melania tecta*, *Anth*.
 266. *Melania tenebro-cincta*, *Anth*.
 267. *Melania tenebrosa*, *Lea*.
 268. *Melania terebralis*, *Lea*.
 269. *Melania teres*, *Lea*.
 270. *Melania textilosa*, *Anth*.
 271. *Melania torquata*, *Lea*.
 272. *Melania torta*, *Lea*.
 273. *Melania torulosa*, *Anth*.
 274. *Melania tracta*, *Anth*.
 275. *Melania trochiformis*, *Conr*.
 276. *Melania Troostiana*, *Lea*.
 277. *Melania tuberculata*, *Lea*.
 278. *Melania turgida*, *Lea*.
 279. *Melania uncialis*, *Hald*.
 280. *Melania undosa*, *Anth*.
 281. *Melania undulata*, *Say*.
 282. *Melania valida*, *Anth*.
 283. *Melania Vanuxemensis*, *Lea*.
 284. *Melania varicosa*, *Ward*.
 285. *Melania venusta*, *Lea*.
 286. *Melania versipellis*, *Anth*.
 287. *Melania vestita*, *Conr*.
 288. *Melania vicina*, *Anth*.
 289. *Melania virens*, *Anth*.
 290. *Melania virgata*, *Lea*.
 291. *Melania virginica*, *Gmel*.
 292. *Melania viridis*, *Lea*.
 293. *Melania viridula*, *Anth*.
 294. *Melania vittata*, *Anth*.
 295. *Melania vittata*, *Raf*.
 296. *Melania wahlamatisensis*, *L. W*.
 297. *Melania Warderiana*, *Lea. W*.
 298. *Melania zonalis*, *Raf*.
 299. *Lithasia geniculata*, *Hald*.
 300. *Lithasia lima*, *Conr*.
 301. *Lithasia nuclea*, *Lea*.
 302. *Lithasia nupera*, *Say*.
 303. *Lithasia salebrosa*, *Conr*.
 304. *Lithasia Showalterii*, *Lea*.
 305. *Gyrotoma alabamensis*, *Lea*.
 306. *Gyrotoma ampla*, *Anth*.
 307. *Gyrotoma babylonica*, *Lea*.
 308. *Gyrotoma Buddii*, *Lea*.
 309. *Gyrotoma bulbosa*, *Anth*.
 310. *Gyrotoma carinifera*, *Anth*.
 311. *Gyrotoma castanea*, *Lea*.
 312. *Gyrotoma constricta*, *Lea*.
 313. *Gyrotoma costata*, *Shuttl*.
 314. *Gyrotoma curta*, *Mighels*.
 315. *Gyrotoma cylindracea*, *Müll*.
 316. *Gyrotoma demissa*, *Anth*.
 317. *Gyrotoma excisa*, *Lea*.
 318. *Gyrotoma funiculata*, *Lea*.
 319. *Gyrotoma glandula*, *Lea*.
 320. *Gyrotoma glans*, *Lea*.
 321. *Gyrotoma globosa*, *Lea*.
 322. *Gyrotoma Hartmanii*, *Lea*.
 323. *Gyrotoma incisa*, *Lea*.
 324. *Gyrotoma laciniata*, *Lea*.
 325. *Gyrotoma ovalis*, *Anth*.
 326. *Gyrotoma ovoidea*, *Shuttl*.
 327. *Gyrotoma pagoda*, *Lea*.
 328. *Gyrotoma pumila*, *Lea*.
 329. *Gyrotoma pyramidata*, *Shuttl*.
 330. *Gyrotoma quadrata*, *Anth*.
 331. *Gyrotoma recta*, *Anth*.
 332. *Gyrotoma robusta*, *Anth*.
 333. *Gyrotoma salebrosa*, *Anth*.
 334. *Gyrotoma Showalterii*, *Lea*.
 335. *Gyrotoma virens*, *Lea*.
 336. *Gyrotoma wetumpkaensis*, *L*.
 337. *Leptoxis affinis*, *Hald*.
 338. *Leptoxis altilis*, *Lea*.
 339. *Leptoxis ampla*, *Anth*.
 340. *Leptoxis angulata*, *Conr*.
 341. *Leptoxis Anthonyi*, *Redfield*.
 342. *Leptoxis carinata*, *Anth*.
 343. *Leptoxis carinata*, *DeKay*.
 344. *Leptoxis carinata*, *Lea*.
 345. *Leptoxis carinifera*, *Anth*.
 346. *Leptoxis cincinnatiensis*, *Lea*.
 347. *Leptoxis contorta*, *Lea*.
 348. *Leptoxis corpulenta*, *Anth*.
 349. *Leptoxis costata*, *Anth*.
 350. *Leptoxis crassa*, *Hald*.
 351. *Leptoxis crenata*, *Hald*.
 352. *Leptoxis dentata*, *Couthouy*.
 353. *Leptoxis dentata*, *Lea*.
 354. *Leptoxis dilatata*, *Conr*.
 355. *Leptoxis dissimilis*, *Say*.
 356. *Leptoxis elegans*, *Anth*.
 357. *Leptoxis flammata*, *Lea*.
 358. *Leptoxis formosa*, *Lea*.
 359. *Leptoxis Foremani*, *Lea*.
 360. *Leptoxis fusca*, *Hald. W*.
 361. *Leptoxis gibbosa*, *Lea*.
 362. *Leptoxis Griffithiana*, *Lea*.
 363. *Leptoxis incisa*, *Lea*.
 364. *Leptoxis inflata*, *Lea*.
 365. *Leptoxis integra*, *Say*.
 366. *Leptoxis isogona*, *Say*.

367. *Leptoxis ligata*, *Anth.*
 368. *Leptoxis littorina*, *Hald.*
 369. *Leptoxis melanoides*, *Conr.*
 370. *Leptoxis monodontoides*, *Con.*
 371. *Leptoxis Nickliniana*, *Lea.*
 372. *Leptoxis nigrescens*, *Conr.*
 373. *Leptoxis Nuttalliana*, *Lea.* **W.**
 374. *Leptoxis obovata*, *Say.*
 375. *Leptoxis ornata*, *Anth.*
 376. *Leptoxis patula*, *Anth.*
 377. *Leptoxis picta*, *Conr.*
 378. *Leptoxis pisum*, *Hald.*
 379. *Leptoxis plicata*, *Conr.*
 380. *Leptoxis prærosa*, *Say.*
 381. *Leptoxis pumila*, *Conr.*
 382. *Leptoxis Rogersii*, *Conr.*
 383. *Leptoxis rubiginosa*, *Lea.*
 384. *Leptoxis solida*, *Lea.*
 385. *Leptoxis Showalterii*, *Lea.*
 386. *Leptoxis squalida*, *Lea.*
 387. *Leptoxis subglobosa*, *Say.*
 388. *Leptoxis taeniata*, *Conr.*
 389. *Leptoxis trilineata*, *Say.*
 390. *Leptoxis trivittata*, *DeKay.*
 391. *Leptoxis Troostiana*, *Lea.*
 392. *Leptoxis tuberculata*, *Lea.*
 393. *Leptoxis turgida*, *Hald.*
 394. *Leptoxis variabilis*, *Lea.*
 395. *Leptoxis virens*, *Lea.* **W.**
 396. *Leptoxis viridula*, *Anth.*
 397. *Leptoxis vittata*, *Lea.*
 398. *Leptoxis zebra*, *Anth.*
 399. *Io brevis*, *Anth.*
 400. *Io fluvialis*, *Say.*
 401. *Io inermis*, *Anth.*
 402. *Io spinosa*, *Lea.*
 403. *Io spirostoma*, *Anth.*
 404. *Io tenebrosa*, *Lea.*
 405. *Io turrita*, *Anth.*
Viviparidæ.
 406. *Vivipara acuta*, *Raf.*
 407. *Vivipara alleghanensis*, *Gr.*
 408. *Vivipara angulata*, *Lea.*
 409. *Vivipara castanea*, *Müll.* **G.**
 410. *Vivipara castanea*, *Val.*
 411. *Vivipara coarctata*, *Lea.*
 412. *Vivipara contorta*, *Shuttl.*
 413. *Vivipara coosaensis*, *Lea.*
 414. *Vivipara cornea*, *Val.*
 415. *Vivipara cyclostomatiformis*,
Lea.
 416. *Vivipara decapitata*, *Anth.*
 417. *Vivipara decisa*, *Say.*
 418. *Vivipara Elliotti*, *Lea.*
 419. *Vivipara exilis*, *Anth.*
 420. *Vivipara genicula*, *Conr.*
 421. *Vivipara georgiana*, *Lea.*
 422. *Vivipara gonula*, *Raf.*
 423. *Vivipara Haleiana*, *Lea.*
 424. *Vivipara humerosa*, *Anth.*
 425. *Vivipara incrassata*, *Lea.*
 426. *Vivipara integra*, *Say.*
 427. *Vivipara intertexta*, *Say.*
 428. *Vivipara lacustris*, *Raf.*
 429. *Vivipara lima*, *Anth.*
 430. *Vivipara magnifica*, *Conr.*
 431. *Vivipara microstoma*, *Kirtl.*
 432. *Vivipara multicarinata*,
Hald. **M**
 433. *Vivipara nitida*, *Rav.*
 434. *Vivipara plaioxis*, *Raf.*
 435. *Vivipara ponderosa*, *Say.*
 436. *Vivipara scalaris*, *Jay.*
 437. *Vivipara regularis*, *Lea.*
 438. *Vivipara rudis*, *Rav.*
 439. *Vivipara rufa*, *Hald.*
 440. *Vivipara rugosa*, *Raf.*
 441. *Vivipara subcarinata*, *Say.*
 442. *Vivipara subglobosa*, *Say.*
 443. *Vivipara subpurpurea*, *Say.*
 444. *Vivipara subsolida*, *Anth.*
 445. *Vivipara sulculosa*, *Menke.*
 446. *Vivipara transversa*, *Say.*
 447. *Vivipara Troostiana*, *Lea.*
 448. *Vivipara verrucosa*, *Raf.*
 449. *Vivipara vivipara*, *Lin.*
 450. *Vivipara Wareana*, *Shuttl.*
 451. *Bithinia nuclea*, *Lea.* **W.**
 452. *Bithinia seminalis*, *Hinds.* **W.**
 453. *Bithinia tentaculata*, *Lin.* **G.**
 454. *Valvata humeralis*, *Say.* **M.**
 455. *Valvata pupoidea*, *Gld.*
 456. *Valvata sincera*, *Say.* **W. E.**
 457. *Valvata tricarinata*, *Say.*
 458. *Ampullaria depressa*, *Say.*
 459. *Ampullaria flagellata*, *Say.* **M.**
 460. *Ampullaria malleata*, *Jonas.* **M.**
 461. *Ampullaria paludinoidea*, *De*
Crist. et Jan. **M.**
 462. *Ampullaria reflexa*, *Sw.* **M.**
 463. *Ampullaria scalaris*, *D'Orb.* **M.**
 464. *Ampullaria urceus*, *Linn.?* **M.**
 465. *Ampullaria violacea*, *Val.* **M.**
 466. *Amnicola attenuata*, *Hald.*
 467. *Amnicola cincinnatensis*, *A.*
 468. *Amnicola decisa*, *Hald.*
 469. *Amnicola elongata*, *Jay.*
 470. *Amnicola galbana*, *Hald.*

471. *Amnicola granum*, Say.
 472. *Amnicola lapidaria*, Say.
 473. *Amnicola limosa*, Say.
 474. *Amnicola longinqua*, Gld. W.
 475. *Amnicola lustrica*, Say.
 476. *Amnicola Nickliniana*, Lea.
 477. *Amnicola obtusa*, Lea.
 478. *Amnicola orbiculata*, Lea.
 479. *Amnicola pallida*, Hald.
 480. *Amnicola parva*, Lea.
 481. *Amnicola porata*, Say.
 482. *Amnicola protea*, Gld. W.
 483. *Amnicola tenuipes*, Couper.
 484. *Amnicola Sayana*, Anth.

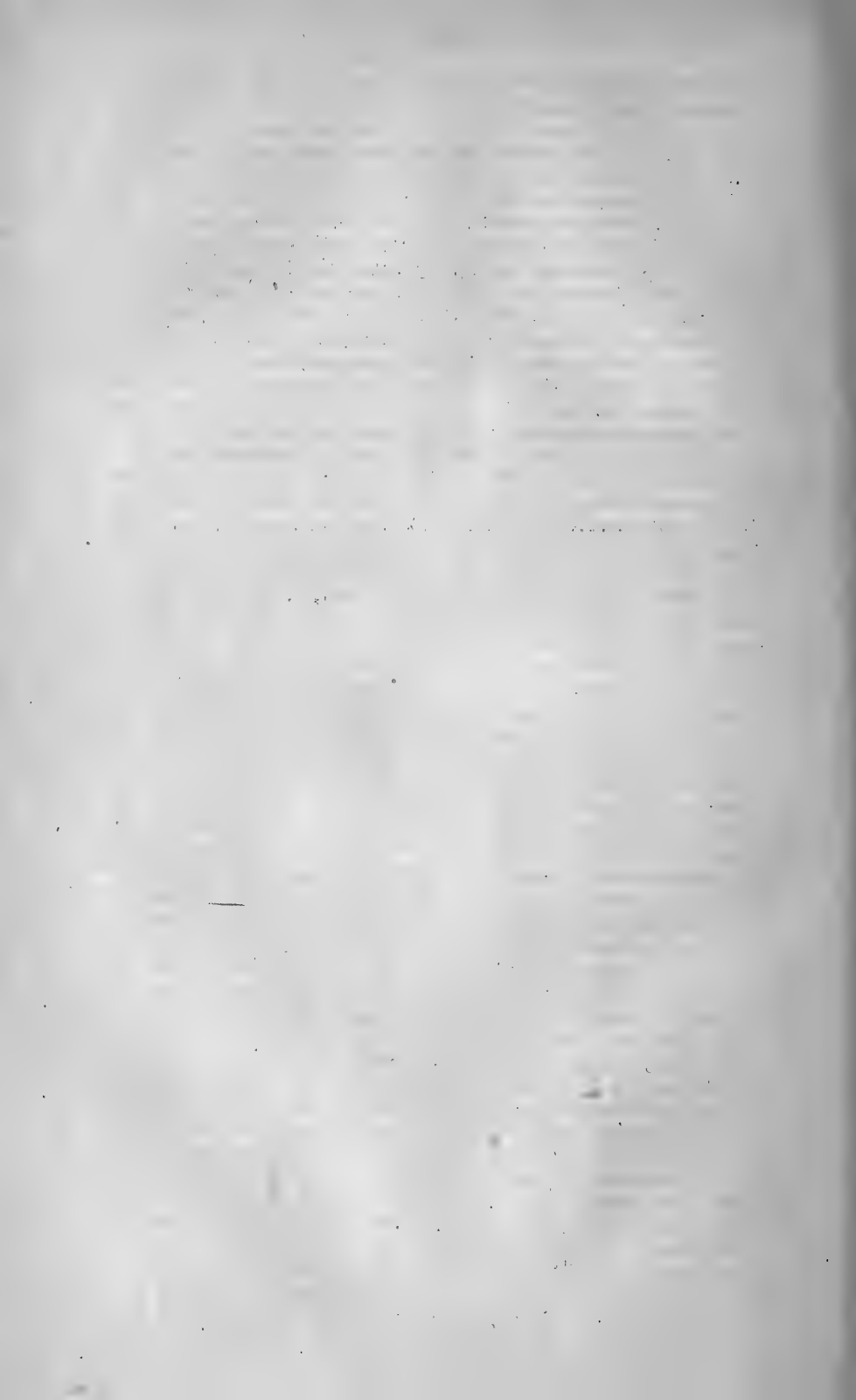
PULMONOBRANCHIATA.

Limnæidæ.

485. *Limnæa ampla*, Mighels.
 486. *Limnæa apicina*, Lea. W.
 487. *Limnæa appressa*, Say.
 488. *Limnæa attenuata*, Say. M.
 489. *Limnæa bulimoides*, Lea. W.
 490. *Limnæa caperata*, Say.
 491. *Limnæa casta*, Lea.
 492. *Limnæa catascopium*, Say. W. E.
 493. *Limnæa coarctata*, Lea.
 494. *Limnæa columella*, Say.
 495. *Limnæa curta*, Lea.
 496. *Limnæa decollata*, Mighels.
 497. *Limnæa desidiosa*, Say.
 498. *Limnæa exigua*, Lea. W. E.
 499. *Limnæa expansa*, Hald.
 500. *Limnæa ferruginea*, Hald. W.
 501. *Limnæa fusiformis*, Lea.
 502. *Limnæa galbana*, Say.
 503. *Limnæa gracilis*, Jay.
 504. *Limnæa groenlandica*, Beck. G.
 505. *Limnæa Griffithiana*, Lea.
 506. *Limnæa Haydeni*, Lea.
 507. *Limnæa Holbollii*, Beck. G.
 508. *Limnæa humilis*, Say.
 509. *Limnæa jugularis*, Say. W. E.
 510. *Limnæa Kirtlandiana*, Lea.
 511. *Limnæa lanceata*, Gld.
 512. *Limnæa lepida*, Gld. W.
 513. *Limnæa megasoma*, Say.
 514. *Limnæa obrussa*, Say.
 515. *Limnæa pallida*, Ad. W. E.
 516. *Limnæa palustris*, Lin. W. E.
 517. *Limnæa parva*, Lea.
 518. *Limnæa Pingelii*, Beck. G.
 519. *Limnæa planulata*, Lea.
 520. *Limnæa platyostoma*, Hald.
 521. *Limnæa plica*, Lea.
 522. *Limnæa proxima*, Lea. W.
 523. *Limnæa reflexa*, Say.
 524. *Limnæa rugosa*, Val. M.
 525. *Limnæa rustica*, Lea.
 526. *Limnæa solida*, Lea. W.
 527. *Limnæa strigosa*, Lea.
 528. *Limnæa subulata*, Dunk. M.
 529. *Limnæa VahlII*, Beck. G.
 530. *Limnæa vitrea*, Hald.
 531. *Pompholyx effusa*, Lea. W.
 532. *Physa ancillaria*, Say.
 533. *Physa aurantia*, Carp. W.
 534. *Physa bullata*, Gld. W.
 535. *Physa Charpentieri*, Küst.
 536. *Physa concolor*, Hald. W.
 537. *Physa distorta*, Hald.
 538. *Physa elata*, Gld. W.
 539. *Physa fragilis*, Mighels.
 540. *Physa globosa*, Hald.
 541. *Physa gyrina*, Say.
 542. *Physa heterostropha*, Say. W. E.
 543. *Physa Hildrethiana*, Lea.
 544. *Physa humerosa*, Gld. W.
 545. *Physa hypnorum*, Lin. W. E.
 546. *Physa inflata*, Lea.
 547. *Physa integra*, Hald.
 548. *Physa mexicana*, Phil. M.
 549. *Physa microstoma*, Hald.
 550. *Physa nitens*, Phil. M.
 551. *Physa osculans*, Hald. M.
 552. *Physa Philippii*, Küster.
 553. *Physa pomilia*, Conr.
 554. *Physa semiplicata*, Küst. ?
 555. *Physa scalaris*, Jay.
 556. *Physa solida*, Phil.
 557. *Physa triticea*, Lea.
 558. *Physa Troostiana*, Lea.
 559. *Physa vinosa*, Gld.
 560. *Physa virgata*, Gld. W.
 561. *Physa virginea*, Gld. W.
 562. *Planorbis albus*, Müll.
 563. *Planorbis ammon*, Gld. W.
 564. *Planorbis antrorsus*, Conr.
 565. *Planorbis arcticus*, Beck. G.
 566. *Planorbis armigerus*, Say.
 567. *Planorbis bellus*, Lea.
 568. *Planorbis bicarinatus*, Say.
 569. *Planorbis Buchanensis*, Lea.
 570. *Planorbis campanulatus*, Say.
 571. *Planorbis corpulentus*, Say. W. E.
 572. *Planorbis deflectus*, Say.
 573. *Planorbis dilatatus*, Gld.
 574. *Planorbis exacutus*, Say.

575. *Planorbis fragilis*, *Dunk.* **M.**
 576. *Planorbis glabratus*, *Say.* **W. E.**
 577. *Planorbis gracilentus*, *Gld.* **W.**
 578. *Planorbis Haldemani*, *D.* **M.**
 579. *Planorbis lentus*, *Say.* **W**
 580. *Planorbis Liebmanni*, *D.* **M**
 581. *Planorbis multivolvis*, *Case.*
 582. *Planorbis Newberryi*, *Lea.* **W.**
 583. *Planorbis obtusus*, *Lea.*
 584. *Planorbis opercularis*, *Gld.* **W.**
 585. *Planorbis planulatus*, *Cooper.* **W.**
 586. *Planorbis parvus*, *Say.*
 587. *Planorbis regularis*, *Lea.*
 588. *Planorbis subcrenatus*, *Carp.* **W.**
 589. *Planorbis tenuis*, *Phil.* **M.**
 590. *Planorbis Traskii*, *Lea.* **W.**
 591. *Planorbis trivolvis*, *Say.* **W. E.**
 592. *Planorbis trivolvis*, *Say.*
 var. fallax.
 593. *Planorbis tumens*, *Carp.* **W.**
 594. *Planorbis tumidus*, *Pf.* **M.**
 595. *Planorbis vermicularis*, *Gld.* **W**
 596. *Planorbis Wheatleyi*, *Lea.*
 597. *Ancylus calcarius*, *DeKay.*
 598. *Ancylus crassus*, *Hald.* **W.**
 599. *Ancylus depressus*, *Hald*
 600. *Ancylus diaphanus*, *Hald.*
 601. *Ancylus elatior*, *Anth.*
 602. *Ancylus filiosus*, *Conr.*
 603. *Ancylus fuscus*, *Adams.*
 604. *Ancylus Newberryi*, *Lea.* **W.**
 605. *Ancylus Nuttalli*, *Hald.* **W.**
 606. *Ancylus obscurus*, *Hald.*
 607. *Ancylus parallelus*, *Hald.*
 608. *Ancylus patelloides*, *Lea.* **W**
 709. *Ancylus rivularis*, *Say.*
 610. *Ancylus tardus*, *Say.*

(f)



From the Proceedings of the Academy of Natural Sciences of Philadelphia, 1861, p. 330, et. seq q

Catalogue of land and fresh water univalve MOLLUSKS collected in British America by Messrs. Ross, Kennicott and Drexler, and deposited in the Smithsonian Collection.

BY W. G. BINNEY.

From English River.

- Helix arborea* Say.
chersina Say.
striatella Anthony.
Bulimus harpa Say.
Achatina lubrica Müll.
Limnæa jugularis Say.
appressa Say.
ampla Mighels.
palustris Lin.
Physa heterostrophæ Say.
hypnorum Lin.
Planorbis trivolvis Say.
From Ft. Simpson, on Mackenzie's River.
Succinea avara Say.
lineata W. G. B. ?
Limnæa appressa Say.
palustris Lin.
Planorbis trivolvis Say.
parvus Say.

From Fort Resolution, Slave Lake.

- Succinea Haydeni* W. G. B., var. minor.
Physa hypnorum Lin.

From Hudson's Bay.

- Limnæa appressa* Say.
palustris Lin.
caperata Say ?

From James' Bay.

- Succinea ovalis* Gld., non Say ?
Bulimus harpa Say.
Physa ——— ?
Planorbis armigerus Say.

From Moose Fort.

- Limnæa* ——— n. sp. ?

From Moose Factory.

- Vitrina limpida* Gld.
Succinea ovalis Gld. non Say.
obliqua Say.
Helix arborea Say.
striatella Anthony.
labyrinthica Say.
monodon Rackett.
young albolabris or *thyroides*.
Achatina lubrica Müll.
Limnæa palustris Lin.
appressa Say.
Physa heterostrophæ Say.
Planorbis bicarinatus Say.
parvus Say.
Amnicola lustrica Say.
porata Say.
limosa Say.
Valvata tricarinata Say.

[Oct.

Notes on the Terrestrial Mollusks of the Peninsula of California.

BY W. G. BINNEY.

Our knowledge of the air-breathing mollusks of Lower California is derived almost entirely from the labors of Mr. John Xantus. The specimens collected by him, and from which the following descriptions are drawn, are deposited in the collection of the Smithsonian Institution.

The South American type of *Bulimus* appears to prevail, while the presence of undoubted specimens of *B. proteus* and *pallidior* is an interesting fact in the study of geographical distribution.

HELIX AREOLATA Sowb. Cerros Island. (Dr. Veatch.)

HELIX PANDORÆ Forbes. Margarita Island. (My cabinet.) San Juan? (Forbes.)

BULIMUS EXCELSUS Gould. La Paz. (California Acad. Nat. Sc. coll.)

BULIMUS VESICALIS Gould. Lower California. (Gould.)

BULIMUS PALLIDIOR Sowb. (*B. vegetus* Gould.)—Mr. Xantus found it at Cape San Lucas and 350 miles above. For an account of its habits see that of *B. inscendens* described below. It appears to inhabit the whole peninsula, as Carpenter quotes it from San Diego, and Gould at San Juan. It is found in very great quantities. Sowerby is undoubtedly wrong in giving "South Sea Islands" as locality. Pfeiffer gives S. America on Cumings' authority.

BULIMUS PROTEUS Brod. Cape San Lucas. (Xantus.)—One large specimen agreeing with the figure of Deshayes and Ferussac, pl. 139, figs. 1 and 2, and numerous immature ones, were collected by Mr. Xantus. The colored bands are longitudinal and not transverse as in Reeves' fig. 100, Con. Icon., which is also 8 mill. longer than Mr. Xantus' largest specimen. *B. proteus* is referred to the mountains of Peru by Pfeiffer.

BULIMUS XANTUSI, n. s.—T. rimata; oblongo-ovata; calcarea; striis creberrimis flexuosis longitudinalibus et lineis minutis intercedentibus notata; sutura impressa; anfr. $5\frac{1}{2}$ convexi, ultimus 5-7 long. testæ æquans; columella arcuata; apertura obliqua, ovalis; perist. simplex, acutum, marginibus approximatis, columellari reflexo; paries aperturalis callo tenui induta. Long. mill. 21, lat. 8. Ap. 10 longa, 6 lata.

Habitat promont. San Lucas, pænninsulæ Californiæ. Exempla 4 collegit J. Xantus.

Shell rimate, oblong-ovate; chalky-white; marked with numerous longitudinal wavy striæ and decussating minute revolving lines; suture impressed; whorls $5\frac{1}{2}$, convex, the last 5-7ths the length of the shell; columella arched; aperture oblique, oval; perist. simple, sharp, its ends somewhat approaching, that of the columella reflected; the parietal wall of the aperture covered with a light callus.

The four specimens collected are very uniform in outline, size and markings. The peculiar wavy striæ and minute revolving lines are its chief characteristics.

BULIMUS ARTEMISIA, n. s.—T. rimata; subcylindrica, versus apicem obtusam, distinctè lirata attenuata; tenuis, diaphana, læviscula, longitudinaliter vix rugosa; sutura impressa; anfr. 8, planiusculi, regulariter accrescentes, ultimus $\frac{1}{2}$ long. testæ æquans; apertura obliqua, ovalis; perist. simplex, vix incrassatum, marginibus approximatis, callo crasso, exstante junctis, columellari dilatato.—Long. 23, diam. 6; ap. 7 long, 5 mill. lata.

Habitat ad promont. San Lucas, pænninsulæ Californiæ, in Artemisia ægens. (J. Xantus.)
1861.]



Shell rimate, subcylindrical, broadest at the second whorl, from which it gradually tapers towards the apex, which is obtuse, its first whorl and a half being bulbous, and marked by numerous strong longitudinal ribs; white; nearly transparent; the longitudinal wrinkles of growth scarcely roughening the almost smooth surface; suture distinct; whorls 8, flattened, regularly and gradually increasing, the last equalling one-half the whole length of the shell; aperture oblique, oval; peristome simple, hardly thickened, its terminations approached, and made continuous by a white, upright callus, the columellar portion expanded.

But one specimen was found on a small species of *Artemisia* at Cape San Lucas, Lower California by Mr. J. Xantus, and is preserved in the collection of the Smithsonian Institution.



BULIMUS PILULA, n. s.—*T. umbilicata*, *globosa*, *inflata*; *tenuis*; longitudinaliter *rugosa*; *calcareo*; apex *obtusa*; anfr. 4 convexi, ultimus *inflatus*, long. testæ 10-11 æquans; *columella simplex*, *arcuata*; *apertura obliqua*, *rotundata*; *perist. simplex*, *acutum*, *marginem columellari dilatato*. Long. mill. 22, lat. 7. Ap. 9 longa, 6 lata.

Habitat in pæninsula Californiæ, ad "Todos Santos Mission," et in insulâ "Marguerita." Saxa degens sub muscis. Specimina plurima collegit J. Xantus.

Shell globose, inflated; umbilicated; thin; with longitudinal wrinkles; chalk-colored; apex obtuse; whorls 4, convex, the last very inflated, equalling 10-11ths the length of the whole shell; columella simple, arched; aperture oblique, rounded; peristome simple, acute, its columellar end expanded so as partially to cover the umbilicus.

Mr. Xantus found many of this species during his stay on the peninsular, and is decidedly of the opinion that maturer specimens, if any existed, would have been noticed by him. It frequents rocky spots, living under mosses.

I can find no figure in Reeves' Monograph or description in Pfeiffer's works of any species at all approaching it in shape. *Bulimus sufflatus* Gould, from Lower California, of which I have seen a specimen, does not appear to be a more mature form of it. The measurements are taken from the largest individual. All the specimens are uniform in outline and other respects.



BULIMUS INSCENDENS, n. s.—*T. rimata*; *acuminato-oblonga*; *tenuis*; *rufo-brunnea*; *striis incrementi et lineis minutis volventibus decussata*, apice *lirata*; *sutura mediocris*; anfr. 7 convexi, ultimus 7-12 long. testæ æquans; *apertura obliqua*, *oblongo-ovata*, *perist. simplex*, *acutum*, *ad columellam reflexum*; *paries aperturalis callo tenui induta*. Long. mill. 36, lat. 10. Ap. 15 longa, 9 lata.

Habitat in montibus arenosis pæninsulæ Californiæ inter "Cape San Lucas" et "Margarita Bay," *inscendens* in arbores "Copal" dictas. (J. Xantus.)

Shell rimate; acuminately oblong; thin; reddish brown; decussated with striæ of growth and minute revolving lines, the apical whorl and a half being ribbed; suture moderate; whorls 7, convex, the last 7-12ths the shell's length; aperture oblique, oblong-ovate; peristome simple, acute, reflected at the columella; a thin callus on the parietal wall of the aperture.

The description is drawn from the most perfect specimen, which is somewhat smaller and more cylindrical than some of the others. On first receiving a single specimen, I was inclined to refer it to *B. excelsus* Gld. A careful examination of the description of that species, however, and of a specimen lately received, convinces me of its being distinct. Its peculiar characteristic is the strongly ribbed, polished apical whorls, differing from the decussated sculpturing of the remainder of the shell.

[Oct.

It was found in great numbers with *B. pallidior* Sowb., climbing high Copaiva trees, called "Copal" by the natives, on dry mountains 800 to 1000 feet high. It was never observed on the table lands or low lands. Mr. Xantus traced it from Cape St. Lucas some 350 miles up the coast.

PEDIPES LIRATA W. G. Binn. Cape San Lucas. (J. Xantus.)

63
SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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MR. WILLIAM G. BINNEY, of Burlington, New Jersey, has been for some time engaged in preparing, by request of the Smithsonian Institution, a descriptive catalogue of the Linnæidæ of North America, as a portion of its proposed series of manuals of American Shells.

With the view of obtaining all possible information relative to the subject of Mr. Binney's researches, it has been considered advisable to distribute proof copies of a Synopsis of the species and their synonymes as they appear to Mr. Binney. The present sheets, therefore, are sent out with this object, and any corrections or additions will be thankfully received and properly acknowledged. As a mere proof, which will undoubtedly receive many corrections, these pages should not be quoted as authority, or referred to as a published work, as was done with a similar proof of Mr. Binney's paper on the *Amnicolidæ*, *Viviparidæ*, &c.

Contributions of specimens, either as types or as collections, serving to illustrate local faunas and variations of character, are solicited; all such will be worked up with the large material already in possession of the Institution, and due credit be given in the lists of specimens. Species to which an asterisk is affixed are particularly desired, they not being represented in the collection.

In the forthcoming work there will be a description and figure of each species, and the original description and a fac-simile of the original figure of each synonym. Full notes on the geographical distribution, synonymy and systematic arrangement will also be given.

JOSEPH HENRY,
Secretary S. I.

SMITHSONIAN INSTITUTION, May 4, 1863.

FAMILY LIMNÆIDÆ.

Genus *Limnæa*.

§ 1.

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|---|---|
| <i>Limnæa jugularis</i> , Say, Hald., De Kay, Küster. | <i>Gould., De Kay, Pot. et Mich., Küst.</i> |
| <i>L. appressa</i> , Say, Hald., C. B. A., De K., Küst. | <i>L. chalybea</i> , Gould. |
| <i>L. stagnalis</i> , Kirtland, Linn.? | <i>L. macrostoma</i> , Say, Gould, Küst. |
| <i>L. speciosa</i> , Ziegler. | <i>L. acuminata</i> , C. B. Ad., not Lam. |
| <i>Limnæa megasoma</i> , Say, Hald., C. B. Ad., De Kay, Küster. | <i>L. navicula</i> , Val. |
| <i>Bulinnea megasoma</i> , Chenu. | <i>L. strigosa</i> , Lea. |
| <i>Limnæa ampla</i> , Mighels, Whiteaves. | <i>L. coarctata</i> , Lea. |
| <i>Limnæa columella</i> , Say, Hald., | <i>L. casta</i> , Lea. |
| | <i>Limnæa decollata</i> , Mighels, C. B. Ad., Küst. |
| | <i>L. catascopium</i> , Hald. |

§ 2.

- | | |
|---|---|
| <i>Limnæa reflexa</i> , Say, Hald., De Kay, Küst. | <i>L. plebeia</i> , Gould? |
| <i>L. elongata</i> , Say. | <i>L. expansa</i> , Hald., De K., Küst. |
| <i>L. umbrosa</i> , Say, Hald., De Kay, Küst. | <i>Limnæa proxima</i> , Lea. |
| <i>L. exilis</i> , Lea, Küst. | <i>Limnæa lanceata</i> , Gould. |
| <i>L. haydeni</i> , Lea. | <i>Limnæa kirtlandiana</i> , Lea. |
| <i>Limnophysa reflexa</i> , Chenu. | <i>Limnæa gracilis</i> , Jay, C. B. Ad., De K., Hald. |
| <i>Limnæa attenuata</i> , Say, De Kay, Hald., Küst. | <i>Acella gracilis</i> , Chenu. |
| <i>L. subulata</i> , Dunk., Küst. | <i>Limnæa desidiosa</i> , Say, Gould, Hald., C. B. Ad., De Kay, Küst. |
| <i>Limnæa fragilis</i> , Lin., Hald., De K. | <i>L. obrussa</i> , Say, De K. |
| <i>L. elodes</i> , Say, Gould, C. B. Ad., Küst. | <i>L. acuta</i> , Lea. |
| <i>L. palustris</i> , Muller, &c. | <i>L. philadelphica</i> , Lea. |
| <i>L. nuttalliana</i> , Lea, Küst. | <i>L. fusiformis</i> , Lea. |

§ 3.

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| <i>Limnæa emarginata</i> , Say, Hald., De K., Küst. | <i>L. cornea</i> , Val. |
| <i>L. ontariensis</i> , Muhlf., Küst. | <i>L. pinguis</i> , Say, not of Dohrn. |
| <i>Limnæa catascopium</i> , Say, Hald., Gould, De K., Mrs. Gray, Pot. & Mich., Küst. | <i>L. virginiana</i> , Lam., Desh. in Lam., Deless. |
| | <i>L. sericata</i> , Ziegl. |
| | <i>Helix catascopius</i> , Eaton. |

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| <i>Limnæa caperata</i> , Say, Hald., C. B. Ad., De K., M. E. Gray, Küst. | <i>Limnæa bulimoides</i> , Lea, Hald., De Kay. |
| <i>L. umbilicata</i> , C. B. Ad., Gld. | * <i>Limnæa galbana</i> , Say, Hald. |
| <i>Limnæa vitrea</i> , Hald., De Kay. | <i>Limnæa solida</i> , Lea, Hald., De K. <i>L. apicina</i> , Lea, Küst. |
| <i>Limnæa lepida</i> , Gld. | <i>Limnæa humilis</i> , Say, Hald., De K. <i>L. parva</i> , Lea. |
| <i>Limnæa pingellii</i> , Beck, Küst. <i>L. vahlii</i> , Mörch? | <i>L. modicella</i> , Say, Gould. |
| <i>Limnæa vahlii</i> , Beck & Möll., Küst. <i>L. grönlantica</i> , Jay. | <i>L. linsleyi</i> , De K., Linsley. |
| <i>L. pingellii</i> , Bk. & Möll? | <i>L. plica</i> , Lea. |
| <i>Limnæa wormskioldii</i> , Mörch. | <i>L. griffithiana</i> , Lea. |
| <i>Limnæa holbollii</i> , Beck & Möll., Küst. | <i>L. planulata</i> , Lea. |
| * <i>Limnæa grönlantica</i> , Beck. | <i>L. rustica</i> , Lea. |
| <i>Limnæa pallida</i> , C. B. Ad., Hald., De Kay. | <i>L. exigua</i> , Lea. |
| | <i>L. curta</i> , Lea. |
| | * <i>Limnæa ferruginea</i> , Hald., De K. |

DOUBTFUL AND SPURIOUS SPECIES.

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|---|---|
| <i>Limnæa decisa</i> , Say. | <i>Limnæa conoidea</i> , H. & A. Ad. |
| <i>Limnæa heterostropha</i> , Say. | <i>Limnæa truncatula</i> , Woodw. |
| <i>Limnæa subcarinata</i> , Say. | <i>Limnæa rugosa</i> , Val., Hald., De Kay, Küst. |
| <i>Limnæa virginica</i> , Say. | <i>Limnæa platystoma</i> , Hald. |
| <i>Limnæa vivipara</i> , Say. | <i>Cyclemis minutissima</i> , Raf. <i>olivacea</i> , Raf. |
| <i>Limnæa nigrescens</i> , De K. | <i>Lomastoma terebrina</i> , Raf. |
| <i>Limnæa reticulata</i> , De Kay. | <i>Omphiscola</i> , Raf. |
| <i>Limnæa heterostropha</i> , C. B. Ad. | <i>Lymnula</i> , Raf. |
| <i>Limnæa ovata</i> , Lam. | <i>Espiphylla nympheola</i> , Raf. |
| <i>Limnæa alternata</i> , Whittes. | |
| <i>Limnæa lineata</i> , H. & A. Ad. | |

FOSSIL SPECIES.

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| <i>Limnæa vetusta</i> , Meek. | <i>Limnæa tenuicostata</i> , Meek & Hayden. |
| <i>Limnæa similis</i> , Meek. | <i>Limnæa meekiana</i> , Evans & Shumard. |
| <i>Limnæa diaphana</i> , Evans & Shumard. | <i>Limnæa? multistriata</i> , Meek & Hayden. |
| <i>Limnæa nebrascensis</i> , Evans & Shumard. | |

Genus **Pompholyx**.**Pompholyx effusa**, Lea, H. & A. Ad.Genus **Physa**.**Physa aurantia**, Carp.*Aplexa aurantia*, Carp.*Aplexa peruviana*, Mke. •**Physa elata**, Gld.*Aplexa elata*, Carp.**Physa gyrina**, Say, De Kay, Küst.,

C. B. Ad., Hald.

Physa elliptica, Lea, De Kay.*Physa cylindrica*, De Kay.*Physa hildrethiana*, Lea.**Physa ampullacea**, Gould.*Physa bullata*, Gld., not Pot. et Mich.**Physa mexicana**, Phil.**Physa vinosa**, Gld.**Physa ancillaria**, Say, Gld., Hald.,

C. B. Ad., De Kay, Küster, Chenu.

Physa obesa, De K.*Physa sayii*, Tappan.**Physa osculans**, Hald.*Physa nitens*, Phil.**Physa heterostropha**, Say, Hald.,

Gould, C. B. Ad., Desh. in Lam., Küst., De Kay, M. E.

Gray, Pot. et Mich.

Linnæa heterostropha, Say.*Physa fontana*, Hald.*Physa cylindrica*, Newc.*Physa aurea*, Lea, De K.*Physa plicata*, De K.*Physa osculans*, Hald. (part).*Physa glabra*, De K.*Physa striata*, Mke.*Physa subarata*, Mke.*Physa charpentieri*, Küst.*Physa phillipii*, Küster.*Physa elliptica*, Lea.*Physa inflata*, Lea.*Helix heterostrophus*, Eaton.*Bulla crassula*, Dillw.*Bulla fontinalis*, Chemn., Gmel., Schroter.*Cochlea neritoides*, List.**Physa hypnorum**, Lin., Hald., C.

B. Ad.

Physa elongata, Say, Gld., De K.*Physa elongatina*, Lewis.*Aplexa hypnorum*, Chenu, &c.**Physa integra**, Hald., De K.*Aplexus (Isodora) integra*, Chenu.***Physa fragilis**, Mighels, C. B. Ad., Hald.***Physa semiplicata**, Küst.***Physa costata**, Newc.**Physa solida**, Phil.**Physa virginea**, Gld.**Physa humerosa**, Gld.**Physa pomilia**, Conrad, De Kay, Muller.***Physa globosa**, Hald.*Phisella globosa*, Chenu.**Physa virgata**, Gld.**Physa microstoma**, Hald.*Physodon microstoma*, Chenu.***Physa distorta**, Hald.**Physa troostiana**, Lea.**Physa triticea**, Lea.***Physa concolor**, Hald., De K.

DOUBTFUL AND SPURIOUS SPECIES.

<i>Physa ampullaria</i> , Lea.	<i>Physa scalaris</i> , Jay, Hald.,
<i>Physa rivalis</i> , Mich.	not Dunker.
<i>Physa planorbula</i> , De Kay.	(<i>Paludina scalaris</i> , Jay.)
<i>Physa fontinalis</i> , Sheppard.	<i>Physa marginata</i> , Bell,
<i>Physa subopaca</i> , Sheppard.	Whiteaves.

FOSSIL SPECIES.

<i>Physa secalina</i> , Evans and Shumard.	<i>Physa (Aplexa) subelongata</i> , Meek and Hayden.
<i>Physa (Aplexa) rhomboidea</i> , Meek and Hdn.	

Genus **Planorbis**.

§ 1.

Planorbis newberryi, Lea.

§ 2.

Planorbis campanulatus , Say, Hald., Gould, C. B. Ad., De Kay, Küst.	<i>Planorbella campanulata</i> , Chenu.
<i>Planorbis bellus</i> , Lea.	Planorbis multivolvis , Case.
<i>Planorbis bicarinatus</i> , Sowb.	<i>Adula multivolvis</i> , H. Adams.
	Planorbis haldemani , Dunker, in Küst., not C. B. Ad.

§ 3.

Planorbis wheatleyi , Lea.	<i>Segmentina armigera</i> , H. and A.
Planorbis armigerus , Say, Hald., Gld., C. B. Ad., De K., M. E. Gray.	Ad.
	<i>Planorbella armigera</i> , Chenu.

§ 4.

Planorbis opercularis , Gld.	<i>Planorbis lens</i> , Lea.
<i>Planorbis planulatus</i> , Cooper.	<i>Planorbis brogniarti</i> , Lea.
Planorbis exacutus , Say, Hald., Gld., C. B. Ad., De K.	<i>Planorbis lenticularis</i> , Lea.
	<i>Planorbis buechanensis</i> , Lea.
	<i>Paludina hyalina</i> , Lea.

§ 5.

Planorbis ammon, Gld.*Planorbis traskii*, Lea.**Planorbis tenuis**, Phil., Küst.*Planorbis mexicanus*, Ziegler.**Planorbis corpulentus**, Say,*Hald.*, De K., Gould.*Planorbis trivolvis*, pars, C.B.Ad.*Helisoma corpulenta*, Chenu.**Planorbis trivolvis**, Say, De Kay,*Gld.*, *Hald.*, C. B. Ad., Küst.,*Pot. et Mich.**Planorbis regularis*, Lea.*Planorbis corpulentus*, Whitt.*Planorbis megastoma*, De K.*Planorbis lentus*, Gld.*Planorbis trivolvis*, var. *fallax*,
*Hald.**Planorbis macrostomus*, Whit-
eaves.*Helix trivolvis*, Eaton.*Physa planorbula*, De K.*Bulla fluviatilis*, Say.*Cochlea trium-orbium*, Lister, Pe-
tiver.**Planorbis truncatus**, Miles.**Planorbis fragilis**, Dunker, Küst.**Planorbis bicarinatus**, Say, M. E.*Gray*, *Hald.*, De K., Küst., C.*B. Ad.*, *Pot. et Mich.*, *Gld.*,
*not of Sowb.**Helix angulata*, Rack., Wood.*Helix bicarinatus*, Eaton.*Planorbis engonatus*, Contr.**Planorbis tumens**, Carp.*Planorbis affinis*, Carp.*Planorbis tenaglophila*, Mke. non
*D'Orb.****Planorbis subcrenatus**, Carp.***Planorbis lautus**, H. Ad.***Planorbis antrorsus**, Contr., De
K., Mull.

§ 6.

Planorbis lentus, Say, *Hald.*, De
Kay.**Planorbis tumidus**, Pfr., Küst.*Planorbis caribæus*, D'Orb.*Planorbis intermedius*, Phil.*Planorbis capillaris*, Beck?**Planorbis glabratus**, Say, *Hald.*,
De K.**Planorbis havanensis**, Pfr., Küst.*Planorbis terveranus*, D'Orb.**Planorbis liebmanni**, Dunk., Küst.*Planorbis gracilentus*, Gld.**Planorbis deflectus**, Say, *Hald.*,*Gld.*, C. B. Ad., De K.*Planorbis virens*, C. B. Ad., De K.*Planorbis obliquus*, De K.*Nautilina deflecta*, Chenu.***Planorbis vermicularis**, Gld.**Planorbis dilatatus**, Gld., *Hald.*,
De K., not Pfr.*Planorbis dilatatus*, *Hald.***Planorbis albus**, Mull., *Hald.**Planorbis hirsutus*, Gould, C. B.
Ad., De Kay.**Planorbis parvus**, Say, *Hald.*,*Gld.*, C. B. Ad., De K.*Planorbis concavus*, Anth.*Planorbis elevatus*, C. B. Ad.,
Gld., De K.*Helix parvus*, Eaton.**Planorbis arcticus**, Beck.

DOUBTFUL AND SPURIOUS SPECIES.

<i>Planorbis parallelus</i> , Say.	<i>Planorbis obtusa</i> , Wheatl.
<i>Planorbis niger</i> , De K.	<i>Planorbis spirorbis</i> , Sheppard.
<i>Planorbis complanatus</i> , Rav.	<i>Planorbis alba</i> , Sheppard.

FOSSIL SPECIES.

<i>Planorbis spectabilis</i> , Meek.	<i>Planorbis convolutus</i> , Meek & Hayden.
<i>Planorbis utahensis</i> , Meek.	<i>Planorbis planoconvex</i> (<i>P.</i> <i>fragilis</i>), Meek & Hay- den.
<i>Planorbis vitrinus</i> , Meek & Hayden.	<i>Planorbis subumbilicata</i> , (<i>Valvata</i>), Meek & Hay- den.
<i>Planorbis nebrascensis</i> , Evans & Shum.	
<i>Planorbis vetulus</i> , Meek & Hayden.	

Genus **Ancylus**.

* Ancylus calcarius , De K.	Ancylus parallelus , Hald., C. B. Ad., De K.
* Ancylus haldemani , Bourg. <i>Ancylus depressus</i> , Hald., not Desh.	<i>Ancylus rivularis</i> , Gld., not Say. Ancylus rivularis , Say, Hald., De K., M. E. Gray, not of Gld.
Ancylus diaphanus , Hald., De K.	Ancylus tardus , Say, Hald., C. B. Ad., De K.
* Ancylus elatior , Anth.	* Ancylus newberryi , Lea.
Ancylus filusus , Conr., Hald., De K., Mull.	* Ancylus crassus , Hald.
Ancylus fuscus , C. B. Ad., Hald., Gld., De K.	Ancylus caurinus , Cooper.
* Ancylus obscurus , Hald.	Ancylus patelloides , Lea.

DOUBTFUL SPECIES.

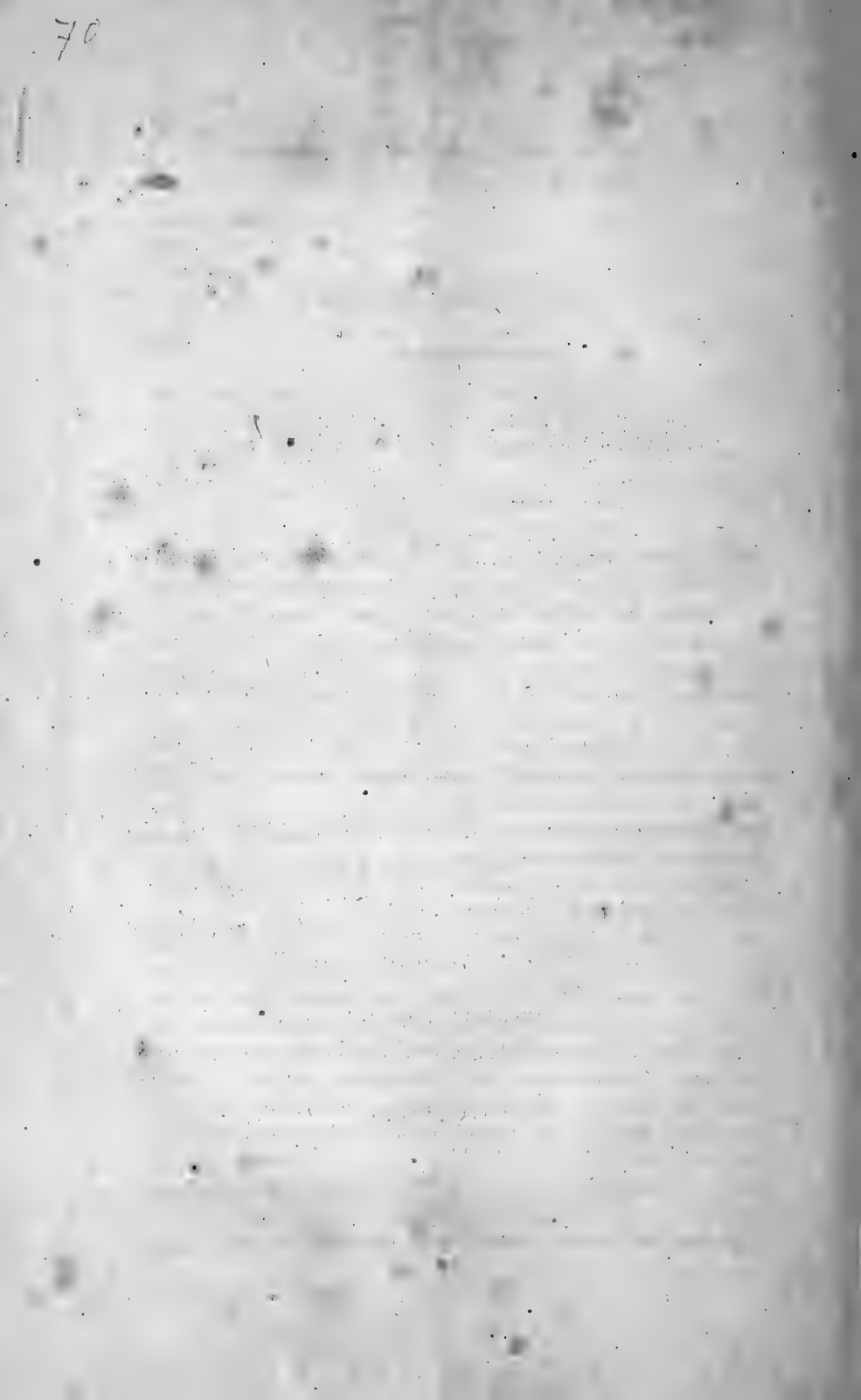
Ancylus drouetianus, Bourg.

Genus **Velletia**.

***Velletia nuttallii**, Hald., De Kay.

FOSSIL SPECIES.

Ancylus (Acroloxus) minutus, Meek & Hayden.



PROOF. Have the kindness to return, with any corrections, to
W. G. Binney, Burlington, New Jersey, WITHOUT DELAY.

DESCRIPTIVE CATALOGUE

OF THE SPECIES OF

AMNICOLA, VIVIPARA, BITHYNIA, VALVATA, AND AMPULLARIA, OF NORTH AMERICA.

It is now twenty-two years since Prof. Haldeman commenced the publication of his "Monograph of the Fresh Water Univalve Mollusca, of the United States," which must always remain the standard work on the genera of which it treats. At that time but little confusion existed in the synonymy of the few species known, as among about thirty specific names given by him in the genera *Paludina*, *Amnicola*, *Valvata*, and *Ampullaria*, but six only were considered synonyms. He had also the advantage of personal knowledge of all but one or two species, not only from the fresh tradition of the collections, but generally also from typical specimens of authors themselves. With these advantages it was possible for him to prepare a monograph of these genera on the decisions of which one could rely, as the most correct possible in that stage of conchological science.

At the present time the case is very different. Instead of thirty descriptions to study, we now have nearly one hundred and fifty. They have been drawn from specimens received from isolated situations, oftentimes by persons who have not had the advantage of studying a large suite of individuals, or comparing typical specimens, or even of access to the descriptions of others. The shells belong to a class characterized, above all others, by a remarkable range of variation, arising from local causes, different stages of growth, or of station, &c. Many of them, at best, are furnished with so few positive external specific characters, that we can depend only for their determination on the discovery of some anatomical differences. Indeed, it appears that to study satis-



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factorily a single species of our fluviatile univalves, one must have before him a very large suite of specimens of all ages from every portion of the district which it inhabits, as well as authentic specimens of every allied described species, with an equally complete suite of individuals of them. Add to this knowledge sufficient to obtain any additional light from the anatomy of the animal, and he may be in a position to speak authoritatively in regard to its specific characters, its relations to other species, its variations, geographical distribution, synonymy, &c.

Not possessing these requisites, I have not attempted to prepare a complete monograph, but rather a report on the present state of our knowledge of the subject. I have given an English translation of all the original descriptions, and a fac-simile of the outline of each original figure. I am in hopes my work will conduce to a more perfect knowledge of the various families, by furnishing a basis for future research.

Although I do not consider myself competent to settle definitely many questions of synonymy, my opportunities have been ample to decide some. In the genera *Ampullaria*, *Valvata*, and *Amnicola*, I have adopted almost all the published descriptions, having but little opportunity of comparison of species, or of gaining information, other than that furnished by Haldeman. In the genus *Vivipara*, I have had better means of making correct decisions. Before studying any descriptions, or, indeed, paying attention to any specific names, I had before me over 90 different lots, containing 320 specimens, exclusive of duplicates, belonging to the Smithsonian Collection, and which had never been assorted or determined. To these I added the specimens figured by Prof. Haldeman in his Monograph, which he has since presented to the Academy of Natural Sciences of Philadelphia. Dr. James Lewis, of Mohawk, very kindly added all his specimens of the genus; Mr. J. G. Anthony all his types, and numerous other interesting specimens; Dr. E. R. Showalter, of Uniontown, Alabama, furnished me with many southern species, in large numbers, of every stage of growth, and from the Philadelphia Academy, I borrowed all their specimens, including Say's types. In addition to the gentlemen already mentioned, I am indebted to the kindness of Mr. Lea for constant access to his extensive collection, the study of his types, with privilege of having them drawn, and much of his valuable time. After having studied the

material before me, I sorted out all the specimens belonging to what appeared to me as the same species into separate lots. Then came the comparison of labels, the study of descriptions and figures, the reference to dates of publication, &c. After my work was done, I laid aside the subject for more than a year. On resuming it lately, I have gone carefully over the whole ground again, and have thus arrived at the following view of the synonymy. Doubtless future research will modify my decisions.

SYNOPTICAL TABLE.

FAMILY. **RISSOIDÆ.**Genus. **Amnicola.**a. *elongated.*

Amnicola attenuata, Hald.

A. elongata in pl.

Amnicola lapidaria, Say.

Cyclostoma lapidaria, Say.

Paludina lapidaria, Küst.

Amnicola longinqua, Gould.

Amnicola nickliniana, Lea.

Paludina nickliniana, Lea.

Amnicola protea, Gould.

Amnicola tenuipes, Couper.

Amnicola sayana, Anthony.

Paludina sayana, Anthony.

Cyclostoma cincinnatiensis, Lea.

Amnicola obtusa, Lea.

Paludina obtusa, Lea.

b. *orbicular.*

Amnicola porata, Say.

Paludina porata, Say.

Amnicola pallida, Hald.

Amnicola lustrica, Adams.

Amnicola lustrica, Say.

Paludina lustrica, Say.

Amnicola limosa, Say.

Paludina limosa, Say.

Amnicola porata, Gould.

Amnicola galbana, Hald.

Amnicola decisa, Hald.

Amnicola cincinnatiensis, Anth.

Paludina cincinnatiensis, Anth.

Paludina emarginata, Küster.

Amnicola granum, Say.

Paludina grana, Say.

Amnicola parva, Lea.

Amnicola orbiculata, Lea.

Amnicola depressa, Tryon.

SPURIOUS SPECIES.

Amnicola isogona, Lea.

albilabris, Wheatley.

dentata, Wheatley.

sayana, Wheatley.

gibbosa, Wheatley.

integra, Hald.

seminalis, Cooper.

nuttalliana, Cooper.

FAMILY. **VIVIPARIDÆ.**Genus. **Vivipara.**a. *nodulous.*

Vivipara magnifica, Conr. (Pal.)

Paludina bimonilifera, Lea.

angulata, Lea.

b. *carinated.*

Vivipara multicarinata, Hald.

Paludina multicarinata, Hald.

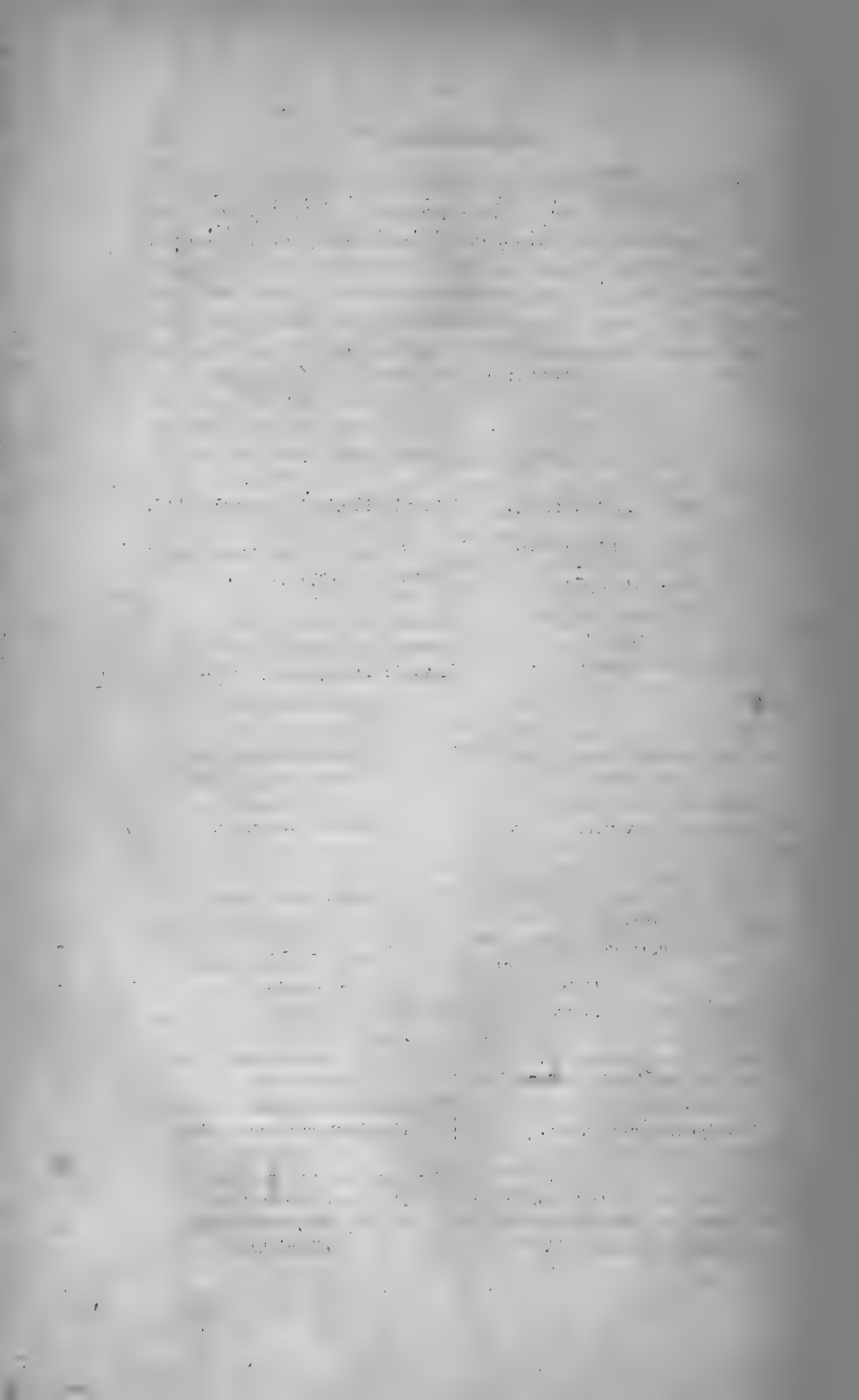
carinata, Val. [Lea.]

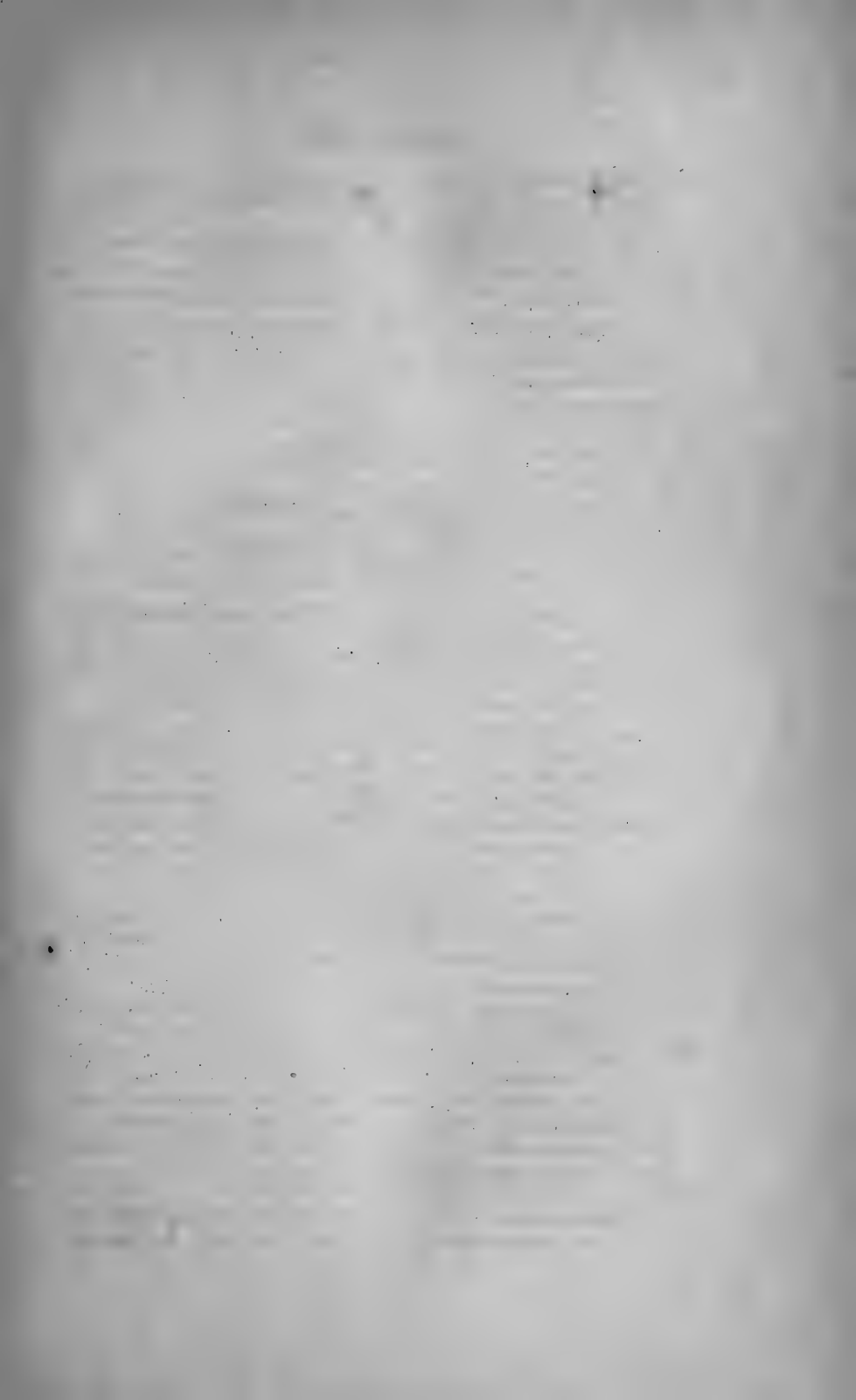
Vivipara cyclostomatiformis,

Paludina cyclostomatiformis, Lea.

contorta, Shuttl.

elliotti, Lea.





Vivipara subcarinata, Say.
Limnæa subcarinata, Say.
Paludina sulculosa, Menke.
bicarinata Pot. et Mich.

Helix decisa, Wood.

c. *simple*.

1. *elongate ovate*.

Vivipara ponderosa, Say. (Pal.)
Paludina maxima, Rav.?

Vivipara decisa, Say. (Pal.)

Melania ovularis, Menke.

Paludina limosa, Val.

cornea, Val.

ponderosa jun., Desh.

heterostrophæ, Kirtl.

microstoma, Kirtl.

rufa, Hald.

integra, Say.

genicula, Conr.

subsolida, Anth.

heros, De Kay.

Helix dissimilis, Wood.

Lymnula ventricosa, Raf.

Ambloxys major, Raf.

Vivipara coarctata, Lea. (Pal.)

Paludina lima, Anth.

exilis, Anth.

compressa, Lewis.

Vivipara subpurpurea, Say.

Paludina subpurpurea Say.

Vivipara texana, Tryon.

Vivipara incrassata, Lea. (Pal.)

Vivipara vivipara, Lin. (*Helix*.)

Paludina lineata, Val.

georgiana, Lea.

2. *subglobose*.

Vivipara intertexta, Say. (Pal.)

Paludina transversa, Say.

Vivipara troostiana, Lea. (Pal.)

Paludina haleana, Lea.

Vivipara wareana, Shuttl. (Pal.)

Vivipara coosaensis, Lea. (Pal.)

Paludina magnifica, pars Hald.

Vivipara decapitata, Anthony.

Paludina decapitata, Anth.

Vivipara regularis, Lea. (Pal.)

Vivipara subglobosa, Say. (Pal.)

DOUBTFUL AND SPURIOUS SPECIES.

Paludina alleghanensis, Green.

Paludina bengalensis, Lam.

P. elongata, Sw.

multilineata, Say.

vitula, Raf.

Paludina unicolor, Lam.

Paludina minuta, Küster.

Paludina hyalina, Lea.

Paludina turrita, Menke.

Paludina aculeus, Küst.

Paludina scalaris, Jay.

Paludina sayana, Küst.

Paludina emarginata, Küst.

Paludina cincinnatiensis, Küst.

Paludina lapidaria, Küst.

Paludina porata, Küst.

Paludina granosa, Kirt.

Paludina lustrica, Küst.

Paludina grana, Say.

Paludina limosa, Say.

Paludina nickliniana, Lea.

Paludina obtusa, Lea.

Paludina nuttalliana, Lea.

Paludina virens, Lea.

Paludina fontinalis, Phil.

Paludina dissimilis, Say.

Paludina altalis, Rav.

Paludina isogona, De Kay.

Paludina pallida, Lea.

Paludina crenata, Brot.

Paludina humerosa, Anthony.

Paludina rudis, Rav.

Paludina nitida, Rav.

Paludina nuclea, Lea.

Paludina seminalis, Hinds.

Paludina tentaculata, Linn.

Vivipara acuta, W. G. Binney.

Vivipara rugosa, W. G. Binney.

Vivipara gonula, W. G. Binney.

Vivipara verrucosa, W. G. Binney.

Vivipara plaioxis, W. G. Binney.

Vivipara lacustris, W. G. Binney.

Genus. **Bithynia.**

- Bithynia nuclea**, Lea. (*Pal.*)
Bithynia seminalis, Hinds. (*Pal.*)
Amnicola seminalis, Cooper.
Bithynia castanea, Müll.
Bithynia tentaculata, Lin. (*Helix.*)

FAMILY. **VALVATIDÆ.**Genus. **Valvata.**

- Valvata tricarinata**, Say. (*Cycl.*)
Valvata carinata, Sowb.
unicarinata, De Kay.
bicarinata, Lea.
Valvata sincera, Say.
Valvata striata, Lewis.
depressa, pars, Küst.
Valvata pupoidea, Gould.
Valvata humeralis, Say.

SPURIOUS SPECIES.

- Valvata arenifera*, Lea.
cinerea, Wheatley.
buccata, Wheatley.

FAMILY. **AMPULLARIIDÆ.**Genus. **Ampullaria.**

- Ampullaria depressa**, Say.
Ampullaria paludosa, Say.
hopetonensis, Lea.

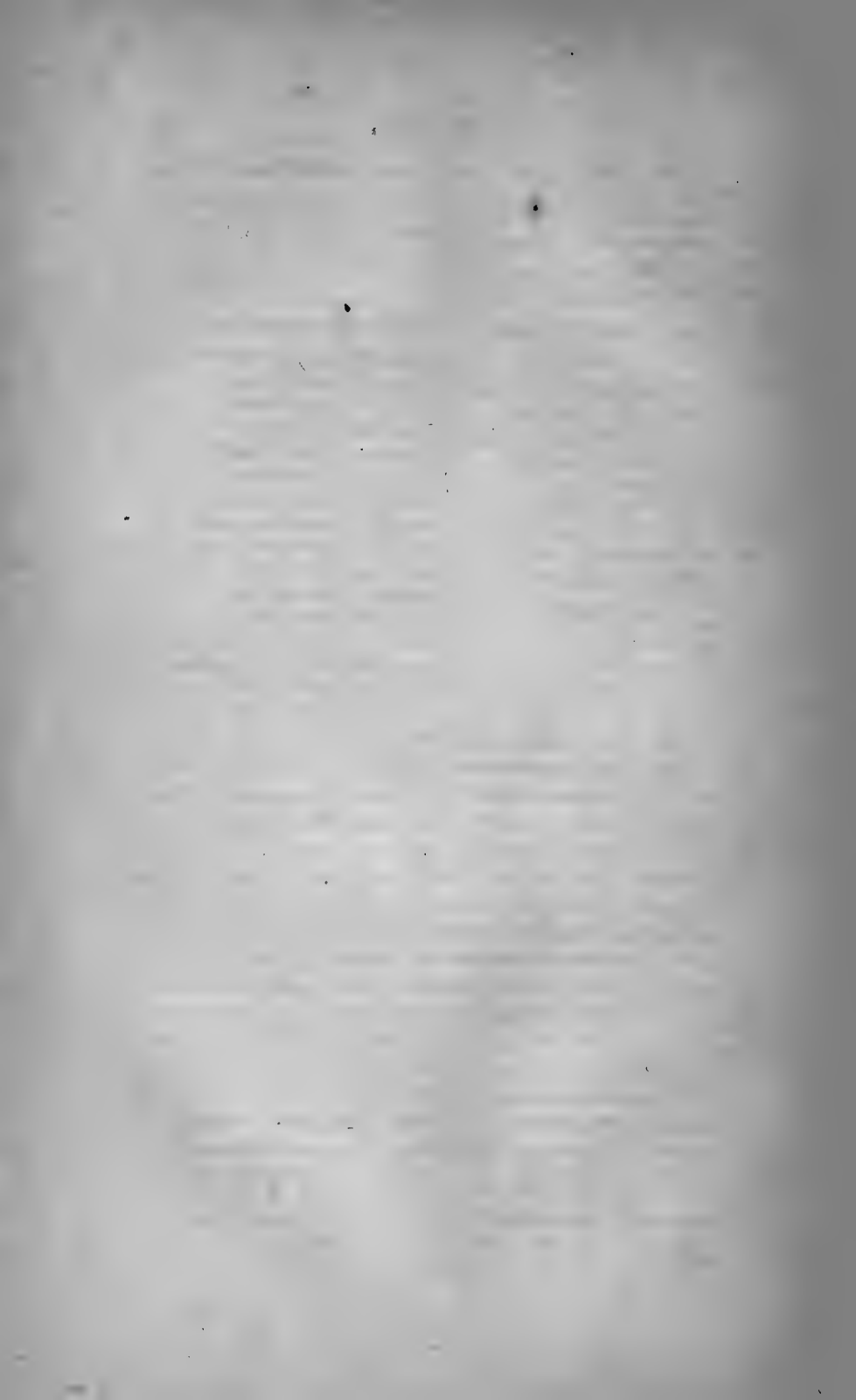
SPURIOUS AND EXTRALIMITAL.

- Ampullaria borealis*, Valenc.
Ampullaria rotundata, Say.
A. globosa, Hald.
Ampullaria urceus, Müll.
Ampullaria flagellata, Say.
Ampullaria flatilis, Reeve.
Ampullaria cerasum, Hanley.
Ampullaria miltocheilus, Reeve.
Ampullaria gheisbrechtii, Reeve.
Ampullaria fumata, Reeve.
Ampullaria violacea, Val.
Ampullaria reflexa, Sowb.
Ampullaria malleata, Jonas. [Ian.
Ampullaria paludinoides, Crist and
Ampullaria scalaris, D'Orb.

The figures are generally in outline, but in connection with the descriptions, will, I hope, answer their purpose. Many have been copied by permission from Haldeman's Monograph. Those drawn from nature are, with few exceptions, by my friend Mr. E. S. Morse, of Portland, Maine.

In the check lists printed in 1860, the genera *Amnicola*, *Vivipara*, *Valvata*, and *Ampullaria*, were placed in one family of *Viviparidæ*. That list was prepared only for the temporary arrangement of the collection. It becomes necessary now to adopt some system of arrangement more in accordance with the recent advancement of conchological science. I have, therefore, followed the system proposed in the Genera of Recent Mollusca, by H. and A. Adams, copying their definitions of families and genera. Their subgenera are not adopted. The characters on which the families and higher divisions are based, are explained in Carpenter's "Lectures on Mollusca," in the Smithsonian Report, 1860, p. 151 *et seq.*

BURLINGTON, N. J., July, 1862.





1890-1891

1891-1892

1892-1893

1893-1894

1894-1895

1895-1896

1896-1897

1897-1898

1898-1899

1899-1900

1900-1901

FLUVIATILE SHELLS

OF

NORTH AMERICA.

PART I.

FAMILY RISSOIDAE.

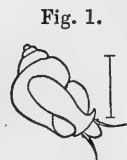
[Lingual membrane with the inner lateral teeth very broad, the apices incurved, lobed; outer laterals dissimilar, all with denticulated apices. Rostrum more or less adnate, below, to the forepart of the foot; tentacles setaceous, with the eyes on bulgings at their outer bases; neck-lobes none. Foot angulated in front, acuminate behind; operculigerous lobe, with developed lateral expansions, and usually furnished with a caudal, tentacular filament. Operculum horny, sub-spiral.

Shell generally white, spiral, more or less turreted; aperture usually simple in front.—*H. and A. Ad.*]

AMNICOLA, GOULD & HALDEMAN.

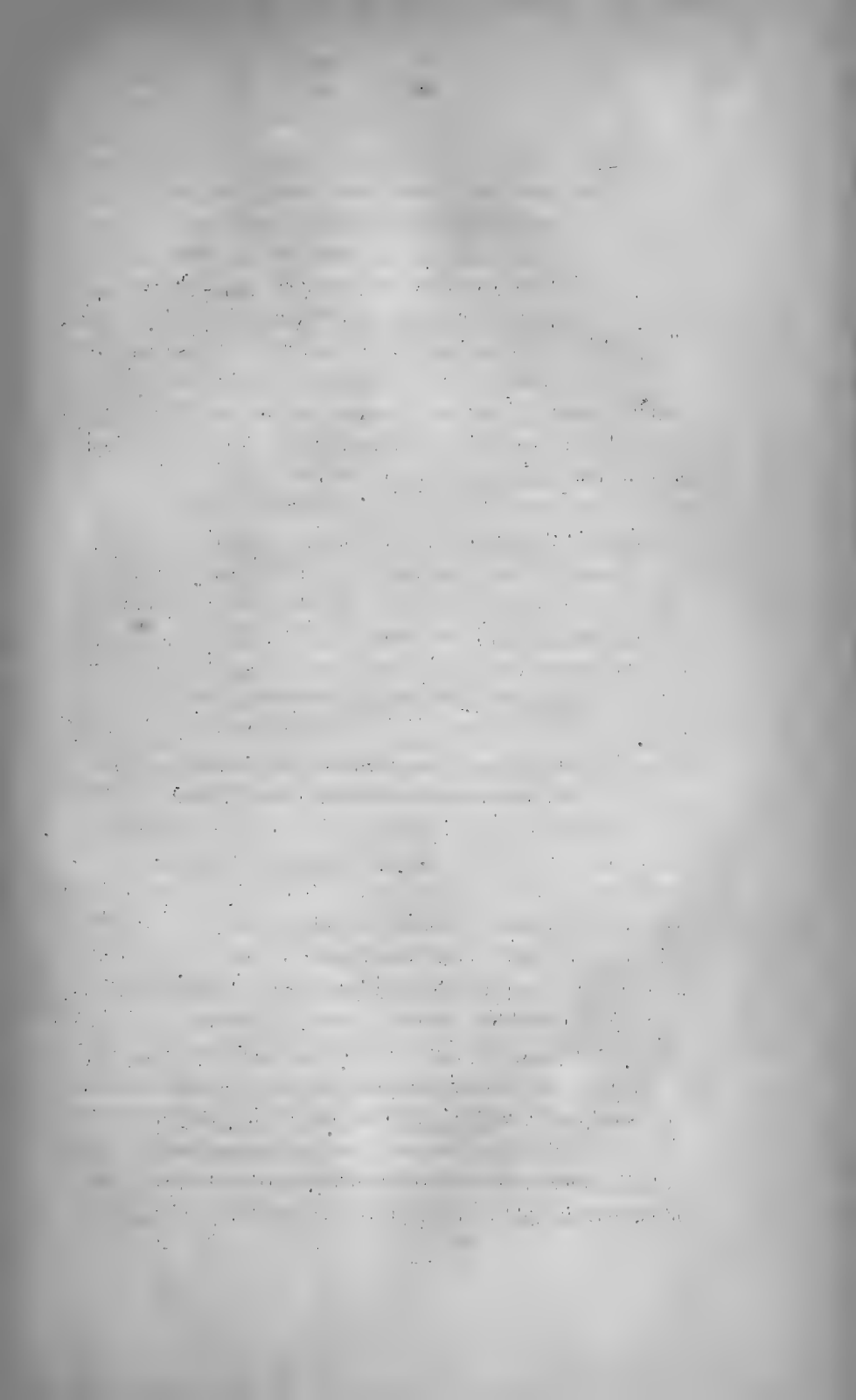
Animal with the head probosciform, rostrum subbifid at the extremity, and extending beyond the foot; mouth a longitudinal slit upon the inferior surface; tentacles setaceous, of equal length; eyes at the posterior external base, not pedunculate: foot sub-ovate or lengthened, truncate anteriorly, the angles capable of being turned outwards as in *Valvata*, but not to so great an extent; and it is incapable of the extension beyond the rostrum observable in *Paludina*.

Shell short or lengthened conic, thin in texture, composed of



Animal of *Amnicola decisa*.





from 4 to 7 convex whirls, separated by a distinct suture; aperture oblique, peritreme simple, detached, or but slightly connected with the body whirl, and usually by a very small portion of its circumference posteriorly; base usually perforate; operculum thin, corneous, composed of a few spiral volutions.

Fig. 2.



Operculum of
Amnicola.

A. decisa and *lustrica*, where I have observed them, live upon the inferior surface of stones in running water. They are tolerably active, and retract suddenly when a shadow is passed over them. The ova are deposited in the month of March, in small oblong detached glairy masses, each of which contains apparently but one germ, which is situated at the larger end of the mass. The color of the germ is orange, of the mass yellowish transparent, with a dark central line upon the surface from end to end. The progression, at least of the short species, is performed upon the foot alone, with a uniform gliding motion, as in *Physa*. (*Haldeman*.)

That this group of small shells should be separated from *Paludina* and also from *Cyclostoma*, in which genus they were included by Cuvier, is clear from the structure of the operculum, but more especially from the structure and habits of the animal. Among the differences, the following are the most obvious: In this genus, the head precedes the foot in progression; in *Paludina* it is the contrary; in this the tentacula are all the way of a size, and without any enlargement for the reception of the eyes, instead of being tapering, with a niche for the eyes; they are also frequently, if not always, unequal in length; perhaps this is a sexual difference. The animal has the power of rising and swimming in an inverted posture at the surface of the water, which the true *Paludina* never does. So far as observation has yet gone, the *Amnicola* is oviparous, while the true *Paludina* is ovo-viviparous. It is found crawling upon stones, sticks, and aquatic plants, while *Paludina* remains upon the mud, and is usually observed partly, or entirely, imbedded in it. On these grounds Mr. Haldeman

concurs with me in instituting the genus *Amnicola*. Its position seems to be intermediate between *Paludina* and *Melania*.

Under this genus will come *P. porata*, *lustrica*, *grana*, and *limosa* of Say; *nickliniana* of Lea; and *cincinnatiensis* of Anthony, and perhaps some of the sub-globular *Melaniæ*.

The genus *Nematura* of Benson includes shells very similar to these, but they are said to have the last whorl contracted, as it approaches the aperture. (*Gould*.)

The figures which I have given are all somewhat enlarged.

I have grouped the species into two sections:—

§ 1. Shell elongate.

§ 2. Shell globose.

§ 1. *Elongate*.

***Amnicola attenuata*, HALD.**—Shell unusually long, slender, with 6 or 7 obliquely revolving, very convex whorls, separated by a deep suture; aperture small, ovate, with the peritreme level and continuous; labium in contact with the body whorl, leaving scarcely any perforation.

Color pale-green beneath an extraneous coating of black.

Taken from a spring in Montgomery County, Virginia, connected with Roanoke River.

I am not confident that this is not the adult of *Nickliniana*, as there is a very close resemblance between that shell and the young of this species, when it has but four volutions.

In the latter, the aperture appears to be rather contracted. (*Haldeman*.)

Amnicola attenuata, HALDEMAN, Mon. pt. 4, p. 3 of wrapper—Ib. Mon. p.

22, pl. i, f. 22—Ib. Journ. Acad. N. Sc. Phila. VIII, p. 200—Ib.

Proc. I, 78.

Amnicola elongata, HALDEMAN, l. c. in plate.

It is also said to inhabit New York. *Amnicola elongata*, Jay of the Smithsonian Check Lists is probably this species. No synonymy or reference is given by Dr. Jay (Cat., p. 278).

***Amnicola lapidaria*, SAY**—Shell turreted, sub-umbilicate, with six volutions, which are obsoletely wrinkled across. Suture impressed. Aperture longitudinally ovate-orbicular, operculated, rather more than one-third of the length of the shell.

Length about one-fifth of an inch. Collection of the Academy of Natural Sciences.

Inhabitant not so long as the shell, pale; head elongated into a rostrum as long as the tentacula, and emarginate at tip; tentacula two, filiform, acuminate at tip, short; eyes

Fig. 3.



Amnicola attenuata.

Fig. 4.



Amnicola lapidaria.





prominent, situated at the external or posterior base of the tentacula; base or foot of the animal dilated, oval, obtuse before and behind.

Found under stones, &c., in moist situations, on the margins of rivers. Like those of the genera *Lymnaea* and *Planorbis*, this animal possesses the faculty of crawling on the surface of the water, in a reversed position, the shell downward. (Say.)

Cyclostoma lapidaria, SAY, Journ. A. N. S. Phila. I, 13; BINNEY's ed. 59.

Amnicola lapidaria, HALDEMAN, Mon. p. 18, pl. i, f. 10.

Paludina lapidaria, KÜSTER in Chemn., ed. 2, p. 54, pl. x, f. 21, 22.

Melania lapidaria, LEWIS, Bost. Proc. VIII, 255.

This is a widely distributed species, ranging at least from Georgia to New York, and from Missouri to Michigan. It is also found in the postpleiocene of the Mississippi River bluffs.

In its habits it differs from most *Amnicolæ*, being often far removed from water, in positions favorable to strictly land species. This fact, of course, would not necessitate its removal from the genus, as such instances have been noticed in other genera. The anatomist must decide the question of its generic station.

Amnicola longinqua, GOULD — Shell small, elongate-ovate, smooth; apex obtuse; whirls 5, rounded; suture deep; aperture elliptical, rounded posteriorly; columella very arcuate, sub-perforate. Length one-eighth, breadth, one-tenth inch.

Found in the Colorado Desert (Cienaga Grande) by W. P. Blake.

In form it is much like *A. cincinnatiensis*, Hald., or like *A. galbana*, or like miniature specimens of *Paludina ponderosa*. It has a bleached or chalky color, probably from exposure, like the other species found on the Cienaga Grande, a region which is immersed a portion of the time, and dry the remainder, and was once, apparently, an extensive marsh, or shallow lake. (Gould.)

Amnicola longinqua, GOULD, Pr. Bost. S. N. H. v, 130.

Amnicola nickliniana, LEA—Shell turreted, green, smooth;

apex obtuse; whirls 4, convex; aperture ovate. Hot Springs, Va. Diam. two-twentieths; length three-twentieths inch.

This shell, with several other species, was brought by Mr. Nicklin from the Hot Springs of Virginia, and kindly placed in my cabinet. It lives in a rivulet, whose channel is supplied by the waters of a hot and a cold spring. The *Physa*

aurea inhabits the same stream. It is the smallest species I know in our country, except the *granosa* of Say. It is rather larger, and very much re-

Fig. 5.



*Paludina
nickliniana.*

Fig. 6.



*Amnicola
nickliniana.*

sembles the *viridis* Lam. Its habitat, however, is very different, as the *viridis* lives in cold fountains. (*Lea*.)

Paludina nickliniana, LEA, Tr. Am. Phil. Soc. VI, 92, pl. xxiii, f. 109.

Amnicola nickliniana, HALDEMAN, Mon., p. 21, pl. i, f. 12.

Mr. Lea's figure (fig. 5) not being as correct a representation as desirable of the species, I add another (fig. 6), copied from Haldeman.

Amnicola protea, GOULD—Shell elongate, slender, variable; whirls 7-8, rounded, divided by a deep suture, simple or variously ornamented, and barred with revolving ridges and longitudinal folds; aperture ovate; lip continuous, simple, scarcely touching the penultimate whirl. Length of the largest specimen three-tenths, breadth, one-tenth inch.

Fig. 6*.

From the Colorado Desert (Gran Jornada), Dr. T. H. Webb, W. P. Blake.

Peculiar from its large size and slender form, though differing greatly in its relative proportions. It differs from all others, in being variously sculptured with revolving ridges and longitudinal folds, like most *Melaniæ*. (*Gould*.)

Amnicola protea, GOULD, Proc. Bost. S. N. H. V, 129. *Amnicola protea*.

Amnicola tenuipes, COUPER—Animal "with the head probosciform, sub-bifid, sub-cylindrical; foot strap-shaped, anterior portion extending laterally, and emarginate before; tentacles setaceous; eyes at the external base of the tentacles; color, except the head and eyes, mottled white.

Shell "small, one and a half lines long, subumbilicated, oblong-ovate, turreted, thin, smooth, lines of growth very slightly marked; color light brown; volutions five, suture slightly impressed; aperture ovate, oblong, angulated above, rounded at base; labrum simple, sharp.

Fig. 7.



Amnicola tenuipes.

"Found in the rice-field ditches at Hopeton, Georgia; movement active, made by the joint action of the head and foot, the head advancing before the foot; floats on the surface of the water in an inverted position." (*Couper in Haldeman*.)

Amnicola tenuipes, COUPER, in Haldeman's Mon. 23, pl. i, f. 14-15; No. 7, p. 4 of wrapper.

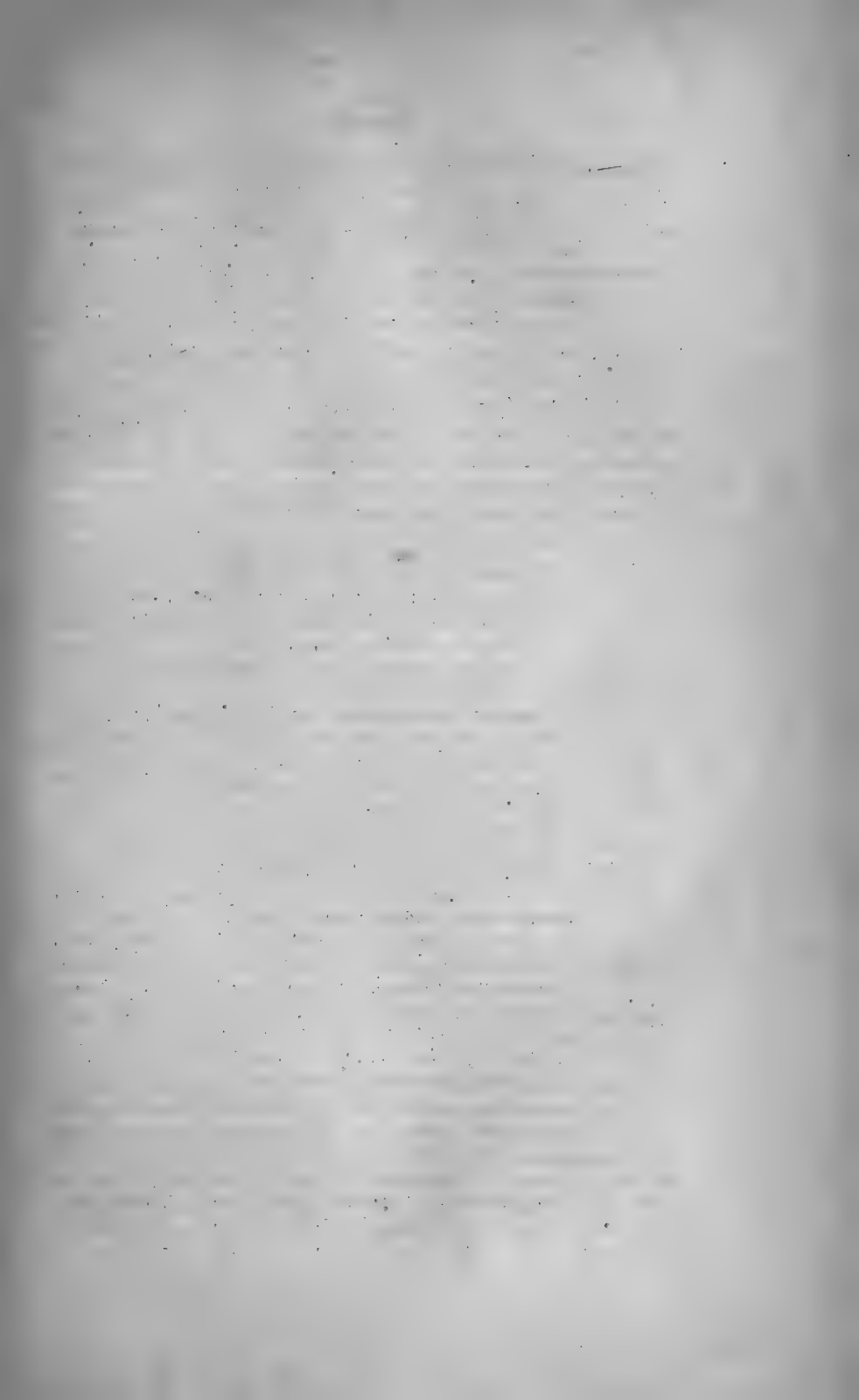
Amnicola sayana, ANTHONY—Shell lengthened, conic, composed of six very convex shining whirls; suture strongly impressed; lines of growth very fine; base with a narrow umbilic; aperture suborbicular; the labium slightly flattened, a small portion of it in contact with the body whirl.

Fig. 8.



Amnicola sayana.

Color bright yellowish-brown, translucent. Inhabits southwestern Ohio.



It is found on wet earth and roots of trees on the margin of a small stream near Cincinnati. (*Haldeman*.)

Cyclostoma cincinnatiensis, LEA, 1843, Tr. Am. Phil. Soc. VIII, 229, pl. vi. f. 62.

Amnicola sayana, HALDEMAN, Mon. p. 19, pl. i, f. 11; pt. 4, p. 4 of wrapper.

Paludina sayana, KÜSTER in Chemn. ed. 2, p. 49, pl. ix, f. 30—32.

The name proposed by Mr. Lea being preoccupied, I have followed Haldeman, in adopting that proposed by Anthony, but never published by him. Troschel (*Gebiss der Schnecken* p. 107, pl. viii, f. 1) figures the lingual membrane of this species; No. 8934 of the collection is from Mr. Anthony. No. 8971 is labelled by Mr. Lea "*Cyclostoma cincinnatiensis*."

Found in Ohio and New York.

Mr. Lea's description and an enlarged view of the outline of his figure here follow:—

Cyclostoma cincinnatiensis.—Shell elevated in the form of a cone, smooth, shining, transparent, umbilicate; whorls 6, apex obtuse; margin of the lip reflected.

Fig. 9.



*Cyclostoma
cincinnatiense*.

Vicinity of Cincinnati. Diam. .13, length .22 inch.

A small species which has been sent to me several times by my brother, who seems first to have observed it. It is about the size, and nearly the color, of *Paludina limosa* Say. It is found on wet earth and roots of trees, on the margin of a small stream near Cincinnati.

§ 2. Orbicular.

Amnicola porata, SAY—Shell obtusely conic or subglobose; volutions four, convex, obsolete wrinkled across; spire obtuse; labrum and labium equally rounded, meeting above in a subacute angle; the upper edge of the latter appressed to the preceding whorl; umbilicus very distinct.



*Amnicola
porata*.

Inhabits Cayuga Lake. Cabinet of the Academy.

This species, which was found by Mr. Jessup, is rather larger and more globose than *P. limosa* to which it is allied, and has a more distinct umbilicus. It resembles *P. decipiens* of Ferrussac, but is much less acute, and rather smaller. (*Say*.)

Paludina porata, SAY, Journ. A. N. Sc. Phila. III, p. 174: BINNEY'S ed. p. 69.—KÜSTER in Chemn. ed. 2, p. 63, pl. xii, f. 4, 5.—PHILIPPI Abbild. 137, t. II, f. 10.

Amnicola porata, HALDEMAN, Mon. p. 13, pl. i, f. 8.—Not of GOULD, Inv. (= *limosa*).—DE KAY, N. Y. Moll. p. 88, pl. xxxv, f. 333—CHENU, Man. de Conch. II, 308; fig. 2194.

Big Sioux River is the only other locality of which I have heard.

Amnicola pallida, HALD.—Shell thin in texture, conical, rather robust, composed of four and a half convex whirls, separated by a well marked suture; spire obtuse, rather longer than the aperture; umbilicus narrow; aperture ovate-orbicular, forming an angle posteriorly; a small portion of the labium confluent with the body whirl posteriorly.

Color pale ochraceous, translucent.

Inhabits Lake Champlain.—Prof. Adams.

Intermediate between *lustrica* and *porata*. It is not as short and transverse as the former, which, moreover, is widely umbilicate, and has the aperture regularly rounded posteriorly. According to the description of Professor Adams, the labium sometimes scarcely touches the body of the shell. The spire is comparatively longer than in *porata*, the outline less transverse, and the aperture not orbicular. (*Haldeman*.)

Amnicola pallida, HALDEMAN, Mon. pt. 4, p. 3 and 4 of wrapper; Mon. p. 12, pl. i, f. 7.

Amnicola lustrica, ADAMS, Thompson's Vermont App. p. 2, 19, teste HALDEMAN.

Amnicola lustrica, SAY—Shell conic; whirls slightly wrinkled, convex; suture profoundly indented; aperture oval, nearly orbicular; labrum with the superior edge not appressed to the preceding whirl, but simply touching it; umbilicus rather large, rounded.

Length, less than one-tenth of an inch. Cabinet of the Academy.

The smallest species I have seen. The aperture somewhat resembles that of a *Valvata*, to which genus it may probably be referable. Mr. Jesup obtained two specimens on the shore of Cayuga Lake. (*Say*.)

Paludina lustrica, SAY, Journ. A. N. S. Phila. II, 174: BINNEY'S ed. p. 69.—KÜSTER in *Chemn.* ed. 2, p. 63, pl. xii, f. 6, 7.

Amnicola lustrica, HALDEMAN, Mon. p. 16.

Found also in Wisconsin.

Amnicola limosa, SAY—Shell conic, subumbilicate, dark horn colored, generally incrustated with a blackish irregular covering on the spire, and sometimes on the body, which completely obscures the obsoletely wrinkled epidermis; aperture ovate-orbicular; suture impressed.

Length three-twentieths, breadth one-tenth, of an inch. Cabinet of the Academy.

Animal whitish; head brown; mouth, tentacula, orbits, and vitta on each side of the neck, white; tentacula filiform, more than half as long as the base of the animal; rostrum about half as long as the tentacula, annulate with darker lines above; foot white, brownish above, short, suboval, truncated before, and rounded behind.

Fig. 11.



Amnicola pallida.

Fig. 12.



Amnicola limosa.

Extremely numerous on the muddy shores of the rivers Delaware and Schuylkill, between high and low water marks. (*Say*.)

Paludina limosa, SAY, Journ. Ac. Nat. Sc. Phila. I, 125—*Ib.* Nich. Encycl. 3d ed.: BINNEY'S ed. p. 61.—DE KAY, N. Y. Moll. 88.

Paludina porata, ADAMS, Shells of Vt. p. 2? (teste HALD.).

Amnicola porata, GOULD, Inv. of Mass. p. 229, f. 157.—HALDEMAN, Mon. 10, pl. i, f. 5, 6.

No. 8960 of the collection is labelled *A. perobtusa* by Dr. James Lewis, but I know of no published description under that name.

From Maine and Wisconsin to Virginia.

Fig. 13. ***Amnicola galbana***, HALD. — Shell conical, smooth, shining, composed of four and a half not very convex whirls, having the lines of growth very fine; base with a narrow umbilic; aperture nearly circular, slightly produced in an angle posteriorly; labium slightly thickened; a small portion of it, which is rectilinear, in slight contact with the body whirl.



Amnicola galbana.

Color . . . bleached and chalky.

Occurs fossil in the fresh water newest tertiary deposit in Sussex County, New Jersey. (*Haldeman*.)

Amnicola galbana, HALDEMAN, Mon. p. 15, pl. i, f. 9; pt. 4, p. 4 of wrapper.

Amnicola decisa, HALD. — Animal dark colored; head blackish, getting lighter posteriorly; tentacles translucent, dark on the edges; an orange-yellow spot at the posterior internal base of the tentacles; foot yellowish, thickly dotted with black above anteriorly; anterior edge nearly as dark as the head; base of the foot thickly dotted with orange on each of the middle, the dotting being more sparse posteriorly, and entirely wanting anteriorly.

Shell rather short, conical; surface smooth, shining (when the dark foreign matter is removed) lines of growth fine; whirls five, not very convex, sutured impressed, base slightly perforate; aperture dilated semicircular, labium slightly concave, in contact with the shell posteriorly, and nearly so throughout its length.



Amnicola decisa.

Color pale-green, and slightly translucent when the black foreign matter is removed. (See fig. 1, on p. 1.)

Inhabits small streams connected with the Susquehanna, and has been observed in the Schuylkill by Dr. Griffith.

Allied to *Paludina similis*, Mich., of Europe. A greater portion of the labium lies closer to the shell in this species than in any other here described, except *A. Nickliniana*, and *A. tenuipes*, which are slender species. At first view it might be taken for a minute *Paludina decisa*, and I have named it accordingly. In my correspondence I have hitherto called this species *limosa*. (*Haldeman*.)

Amnicola decisa, HALDEMAN, Mon. p. 7, pl. i, f. 2, 3.

Amnicola cincinnatiensis, ANTHONY.—Shell somewhat ventricose, subumbilicate, color delicately green, whirls four, smooth; spire entire at the apex and prominent; suture deeply impressed; aperture much dilated, approaching to orbicular, nearly half the length of the shell; length one-fifth of an inch.

Fig. 15.



*Amnicola
cincinnatiensis.*

Found in the canal at Cincinnati, clinging to small stones.
(Anthony.)

Paludina cincinnatiensis, ANTHONY, Boston J. N. H. III, pt. 1 and 2, p. 279, pl. iii, fig. 3, 1840.—KÜSTER in *Chemn.* ed. 2, p. 52, pl. x, f. 13, 14.

Amnicola cincinnatiensis, HALDEMAN, Mon. p. 9, pl. i, f. 4.—DE KAY, N. Y. Moll. 88.

Paludina emarginata, KÜSTER, Ch. ed. 2, p. 50, pl. x, f. 3, 4.

Fig. 16.



*Paludina
emarginata.*
(Mag. 5 times.)

"This is the most robust species hitherto noticed among us, and is, in form, a miniature representation of *Paludina ponderosa*, except that it is decidedly umbilicated." (Haldeman.)

Specimens labelled by Mr. Anthony are in the collection of the Smithsonian. Küster's description now follows. His figure is copied in fig. 16. He quotes *Lymnæus emarginatus*, Say as a synonym on authority of Bronn.

Paludina emarginata, KÜSTER.—Shell small, narrowly rimate, ovate conic, apex eroded, sub-truncated, shining, thin, delicately striate, dark horn colored; spire conic, whirls 4, convex; suture deep; aperture ovate; peristome straight, acute, its columellar portion reflected.

Amnicola granum, SAY—Shell conic-ovate; whirls not perceptibly wrinkled, convex; suture deeply impressed; aperture orbicular, hardly angulated above; labium with the superior edge appressed to the surface of the penultimate volution; umbilicus rather small, profound.

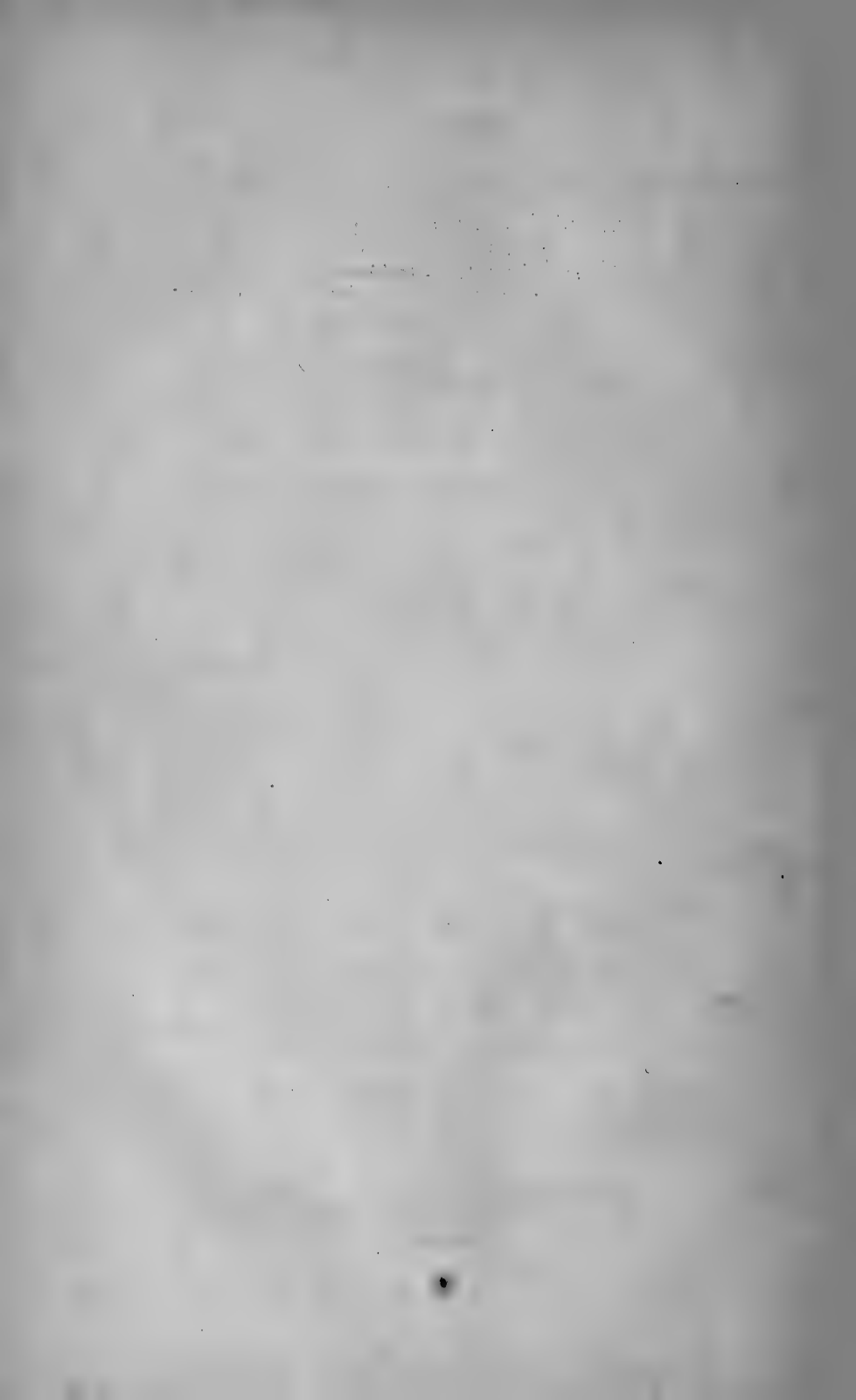
Length less than one-tenth of an inch. Inhabits Pennsylvania.

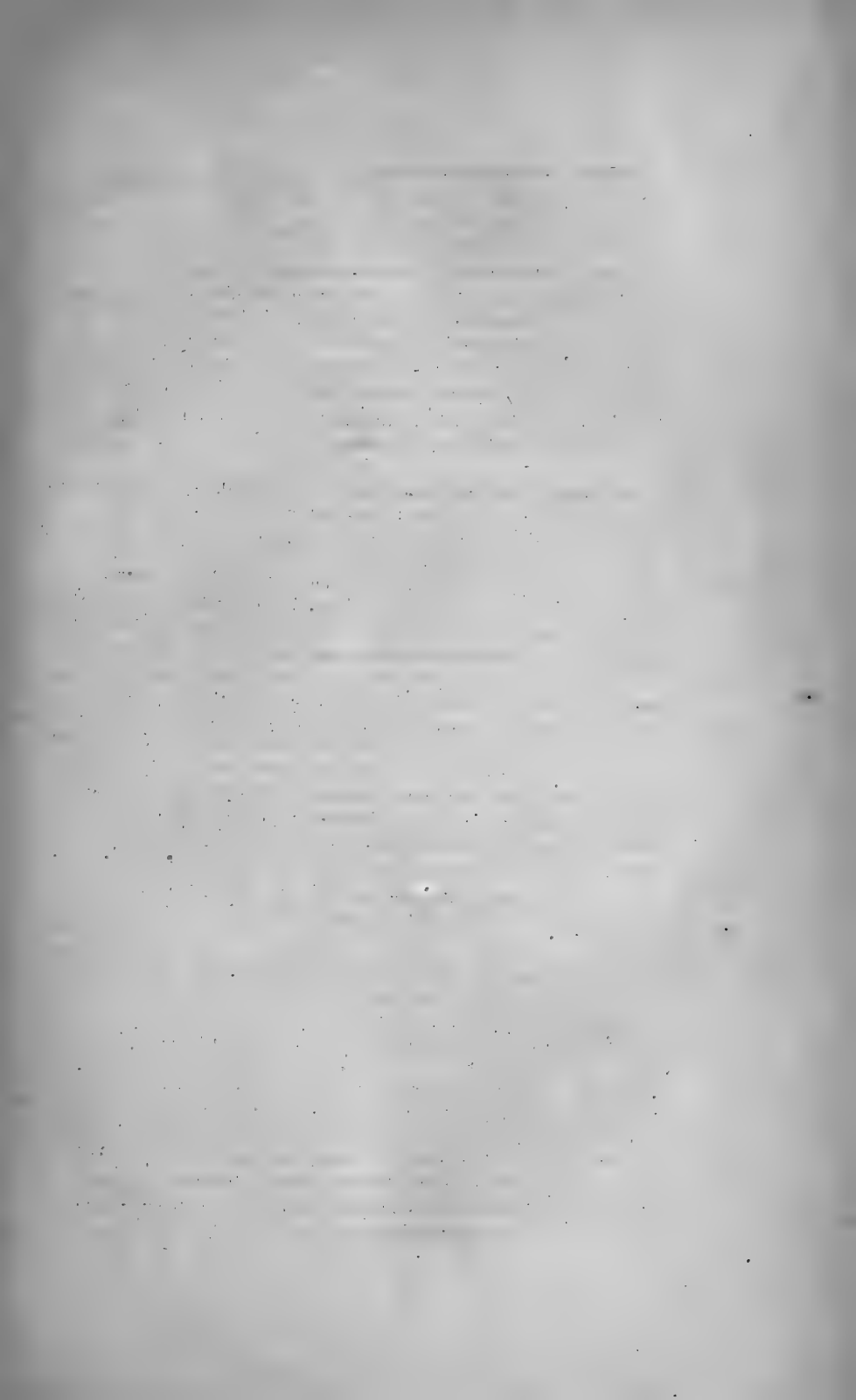
This very small species is found in plenty in the fish ponds at Harrowgate, crawling on the dead leaves which have fallen to the bottom of the water. It resembles *P. lustrica*, but is a smaller, less elongated shell, and the superior portion of the labium is not an unaltered continuation of the lips as in that shell, but is appressed to the surface of the penultimate whorl in the usual manner of calcareous deposition upon that part. (Say.)

Paludina grana, SAY, Journ. A. N. Sc. II, p. 378; BINNEY'S ed. p. 110.

Amnicola granum, HALDEMAN, Mon. p. 17.—DE KAY, N. Y. Moll. 88.

Ranges from Lake Superior to Virginia.





Amnicola parva, LEA—Shell obtusely conical, rather thin, yellowish, smooth, umbilicate; spire short; suture impressed; whorls four, inflated; aperture large, nearly round.

Springfield, Ohio. Diam. .15, length .18 inch.

The shell described by Mr. Anthony as *Paludina Cincinnatiensis*, resembles this species, but is more elevated in the spire, and is a larger shell. It is more nearly allied to *Amnicola orbiculata*, herein described, but may be distinguished by its being a smaller shell, and being less round in the aperture. The base of the lip is disposed to be slightly angular; the aperture is about one half the length of the shell. (Lea.)

Amnicola parva, Lea, Tr. Am. Phil. Soc. IX, p. 16; Proc. II, 34.—HALDEMAN, Mon. p. 24.

Amnicola obtusa, LEA—Shell subcylindrical, rather thin, dark-green, smooth, slightly perforate; spire short; at the beaks very obtuse; sutures impressed; whorls four, convex; aperture small, nearly round.

Ohio. Diam. .07, length .10 inch.

This is among the smallest of the genus, and may at once be distinguished by its obtuse apex, which has the appearance almost of being truncate. The whorls do not decrease regularly from the lower one to the apex, the greatest diameter being apparently across the second whirl. In form, therefore, it has the aspect of a *Pupa*. It answers partly to the description of *Paludina Alleghaniensis*, Green, but seems to differ in the truncate appearance of the apex, and in its size. Two specimens were found in a box, with some other small species, kindly sent me by Dr. Kirtland. It is rather less than *Pal. Nickliniana*, but differs from it in being less tapering to the apex. It closely resembles *P. viridis*, Lam., but is rather larger, and more obtuse. There were no opercula to examine in these specimens; aperture rather more than one-third the length of the shell. (Lea.)

Paludina obtusa, Lea, Tr. Am. Phil. Soc. IX, p. 13; Proc. II, 34.

Amnicola obtusa, HALDEMAN, Mon. p. 24.

Amnicola orbiculata, LEA—Shell orbicular, rather thin, yellowish, smooth, umbilicate; spire short; sutures much impressed; whorls five, inflated; aperture large, round.

Springfield, Ohio. Schuylkill? near Philadelphia. Diam. .18 length .18 inch.

This species is very nearly allied to *Am. parva*, and may prove to be only a variety of it. The specimens before me are all larger, and they appear to be more globose. The aperture is about half the length of the shell. I found a single specimen of this species among many small shells which were thrown together in a box, as being collected from our vicinity. It may be possible it is an Ohio specimen gotten by mistake into the box. Found also in Cayuga Lake. (Lea.)

Amnicola orbiculata, LEA, Tr. Am. Phil. Soc. IX, 16; Proc. II, 34.—HALDEMAN, Mon. p. 24.

Amnicola depressa, TRYON—Shell orbicular, subhyaline; whirls four, convex, the last large, equalling five-sixths the length of the entire shell; umbilicus narrow; aperture semicircular, labrum appressed within; suture impressed. Length and breadth four mill. (Fig. mag. $2\frac{1}{2}$ times.)

Fig. 17.



*Amnicola
depressa.*

Hab. Mississippi River, at Davenport, Iowa; Prof. Sheldon.
Coll. Acad. Nat. Sciences, and Smithsonian Institution.
Prof. D. S. Sheldon. Geo. W. Tryon, Jr.

Shell subhyaline, rather solid, orbicular, with the spire depressed, consisting of four whirls; apex acute, suture profoundly impressed. Body whirl very convex, equalling five-sixths the length of the shell, narrowly umbilicate. Aperture semicircular, the inner lip being nearly straight. The only shell which this resembles is *Vivipara subglobosa*, Say, which differs in being double the size of *A. depressa*, with a rather more exerted spire, and in having a more concave inner lip. (*Tryon.*)

Amnicola depressa, TRYON, Proc. Ac. N. Sc. Phila. Sept. 1862. Not yet published.

SPURIOUS SPECIES.

Amnicola isogona, LEA, Tr. Am. Phil. Soc. IX, 16, is *Leptoxis isogona*.

Amnicola integra, HALDEMAN = *Melania integra*, SAY, Vid. J. Ac. Nat. Sc. VIII. 200.

Amnicola seminalis, COOPER, Rep. on Minnesota, &c., p. 374, = *Bithynia*.

Amnicola nuttalliana, COOPER, Rep. on Minnesota, &c., p. 374, =

The following are mentioned by name only in Wheatley's Cat. of U. S. Shells. No description of them was ever published.

<i>Amnicola albilabris</i> , WARD, Ohio.	|	<i>Amnicola Sayana</i> , LEA, Ohio.
<i>Amnicola dentata</i> , SAY, Florida.	|	<i>Amnicola gibbosa</i> , ANTHONY, Ohio.



FAMILY VIVIPARIDÆ.

[Tongue very short, armed with seven series of teeth (3.1.3); teeth laminar, longitudinal, ovate, apex recurved, dentate on each side of the tips; inner lateral tooth broad. Rostrum moderate, entire; tentacles tapering, with the eyes on tubercles at their outer bases. Mantle simple in front; gill comb-like, single.

Operculum annular, regular.

Shell spiral, turbinated, covered with an epidermis; aperture simple in front.

The members of this family are fluviatile, inhabiting lakes and streams; the shells of most of them are dingy brown, or covered with a green, horny epidermis; they are distributed nearly all over the world.—*H. and A. Ad.*]

VIVIPARA, LAM.

[Animal with a small lobe on each side of the neck.

Operculum horny, annular, composed of concentric elements around a central nucleus.

Fig. 18.



Animal of *Vivipara*.

Shell thin, turbinated, umbilicated; spire produced, whirls round, smooth or carinated, covered with an olivaceous epidermis; peristome thin, continuous, simple anteriorly.

The *Viviparæ* inhabit the rivers and lakes throughout the northern hemisphere. The females are ovo-viviparous, and the young fry are not forsaken by the parent until the end of the second month of their existence, by which time the bands of cilia, which ornament their shells, have disappeared.—*H. and A. Ad.*]

I have had opportunities of studying the habits of no other species than *V. decisa* and *subcarinata*, which are found in great numbers in the Delaware at Burlington, N. J. They live on the muddy bottoms of the river edge, where they are exposed many

hours every day by the fall of the tide. After the water has receded they crawl for some time in the mud, and then burrow into it, entirely concealing their shell, till the return of the tide. The finest specimens are found on a sand bar in the middle of the river, which is also bare at low water. They cease to hibernate in the mud in very early spring, often within a few days after the ice has broken up, and exclude the young shells of two or rather more whirls, which are much oftener heterostrophe in the *decisa* than when mature. The young have remained in the ovaries all winter. The sexes are said to be distinct.

The foot protrudes too far beyond the mouth to allow the animal to eat while in motion. The figure is a fac-simile of the outline of Haldeman's figure of the animal. The eyes will be seen on an enlargement of the outer base of the tentacles. Fig. 49 represents a section of the lingual ribbon of *V. decisa*, for which I am indebted to my friend Mr. E. S. Morse. The food is supposed to be vegetable. Motions very slow.

I have adopted the name *Vivipara*, which I find most generally used. It was published without description or figure by Lamarck (Phil. Zool. 1809 II, 320), who substituted *Paludina*, giving a description, in 1821. Meanwhile, Montfort had given a description and figure under the name *Viviparus* (1810. Conch. Syst. II, 247, lxii).

The geographical distribution of the species is at present but imperfectly known. In general terms, they may be divided into the following groups:—

1. Mexican.

V. multicarinata.

2. Universally distributed, ranging over the whole Union east of the Rocky Mountains, and in Canada.

V. decisa.

3. Southern; confined to the States bordering on the Gulf and Southern Atlantic coast.

V. cyclostomatiformis,

V. intertexta,

V. coosaensis,

V. wareana,

V. haleana,

V. incrassata.

4. Western ; confined to the Middle or Western States.

V. subcarinata,

V. decapitata,

V. regularis,

V. subglobosa.

5. Western and Southern ; not found in Canada or New England, nor perhaps to the east of the Alleghanies.

V. ponderosa,

V. subpurpurea,

V. coarctata,

V. vivipara.

The species are grouped in the following manner :—

Shell nodulous. § 1. *V. magnifica*.

Shell carinated. § 2. *V. multicarinata*,
V. cyclostomatiformis,
V. subcarinata.

Shell simple.

a. *elongate ovate*. § 3. *V. ponderosa*,
V. decisa,
V. coarctata,
V. subpurpurea,
V. incrassata,
V. vivipara.

b. *globose*. § 4. *V. intertexta*,
V. troostiana,
V. wareana,
V. coosaensis,
V. decapitata,
V. regularis,
V. subglobosa.

§ 1. *Shell nodulous*.

Vivipara magnifica, CONRAD—Shell subovate, ventricose, with two spiral bands of prominent tubercles on the body whirl, and one revolving near the base of each whirl of the spire ; suture profoundly impressed, margined by an obtuse, subnodulous, prominent line ; lines of growth very oblique and prominent ; obscure spiral striae ; epidermis olive ; within bluish, often with purple bands.

Fig. 19.



Paludina magnifica.

phen's. Conrad.

A beautiful species when perfect, occurring in vast abundance on the masses of calcareous rock, which have fallen from the strata above into the Alabama River at Claiborne. I found it living only in such situations, and exclusively within a range of six or eight miles. In the Tombeckbee or Black Warrior Rivers, I never observed a specimen of it, although I searched particularly for it on the rocks at St. Ste-

- Paludina magnifica*, CONRAD, N. Fr. W. Shells, 1834, p. 48, pl. viii, fig. 4.—
DE KAY, N. Y. Moll. (1843), p. 86.—KÜSTER in *Chemn.*, ed. 2, 1852,
p. 23, pl. v, figs. 3—6.—PHILIPPI, *Conch.*, III, 1, pl. i, figs. 1, 2.
Paludina bimonilifera, LEA; Tr. Am. Phil. Soc., V, 58, pl. xix, fig. 71,
date of title, 1837.—IB., Obs. I, 170.
Paludina angulata, LEA; Tr. Am. Phil. Soc., IX, 22 (1844).—IB., Obs. IV,
22. Proc. II, 83 (1841).

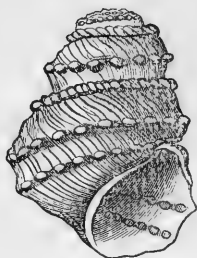
A continuous elevated, heavy, revolving line sometimes takes the place of nodules. The interior of the aperture varies from pure white to a rich dark purple; it is sometimes of a salmon color; the bands are also very variable in number and width. There are also sometimes dark green bands on the exterior of the shell. I have counted as many as four on the body whirl alone. It is variable in size. One specimen which I measured was 50 mill. long. It inhabits Alabama and Georgia.

Fig. 1 is a fac-simile of the outline of Conrad's figure. I have added below a figure of Mr. Lea's species, which is, I believe, identical, fig. 21 being a fac-simile of Mr. Lea's figure, and fig. 22 being taken from a specimen determined by Mr. Lea. No. 8928 of the collection was labelled *Pal. angulata* by Mr. Lea. Haldeman agrees with me in considering this last *Vivipara magnifica* identical with *V. magnifica*. I am indebted to Dr. E. R. Shonkwiler for the other specimen figured.



Vivipara magnifica, Young.

Fig. 20.



Vivipara magnifica.

Fig. 21.



Paludina bimonilifera.

Paludina bimonilifera, LEA.—Shell obtusely turreted, dark horn color; apex obtuse; whirls furnished with two rows of nodules; the nodules of the lower row of the upper whirls hidden by the suture, those of the upper row larger, and visible on all the whirls; sutures deep and irregular; outer lip sub-biangular; base sub-angular.

Alabama River (Judge Tait). My cabinet and those of Prof. Vanuxem, Am. Phil. Soc., Ac. Nat. Sc. Phila., P. H. Nicklin, Baron Ferussac. Diam. 1.1, length 1.8 inches.



This superb *Paludina*, which far surpasses in point of beauty any of our species yet known, I owe to the kindness of Judge Tait. Its beautiful double tuberculated cincture at once distinguishes it from all described species. Some specimens are furnished with dark purple bands which beautifully decorate the interior of the shell, and give a dark rich green color to its fine epidermis. In the others these are wanting, and the epidermis then has a clear and more yellow appearance. The sutures being formed immediately over the lower row of tubercles, they cause its line to be very irregular; and this row itself is hidden on the upper whirls. (*Lea.*)

Paludina angulata, LEA.—Shell inflated, thin, brown, above somewhat varicose, below transversely and minutely striate, minutely perforate; spire rather short, dark at the apex; sutures impressed; whirls five, angular in the middle; aperture large, subtriangular, within subrubiginous.

Fig. 22.

*Paludina angulata.*

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith, Dr. Jay, Dr. Foreman, T. G. Lea, and J. Clark. Diam. .80, length 1.05 inch.

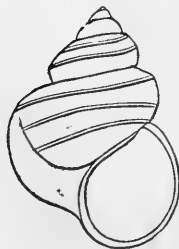
This is a very distinct species, being more angular than any I have seen. In the specimen before me, there are three irregular transverse impressions, two above the angle, and one immediately below. The striae are more distinct on the lower half of the whirl. The first three whirls are very dark. The aperture is nearly one-half the length of the shell, and quite angular at the base.

Since the above was written, I have received more mature and perfect specimens. They differ from the one described in being darker in the epidermis, and in having four purple broad bands, which are very distinct within the aperture. In these specimens, there is a series of indistinct tubercles above the periphery of the last whirl. (*Lea.*)

§ 2. *Shell carinated.*

Vivipara multicarinata, HALD.—Shell conic, thin, subdiaphanous, green, whirls 5, longitudinally striate and transversely carinate.

Fig. 23.

*Paludina carinata.*

This *Paludina* is thinner and lighter than our species, and has but 5 whirls. The length is about one-fifth more than that of the last whirl, of which the diameter is about double that of the penultimate whirl; beside the longitudinal striae, there are four carinas, of which the first and third are stronger than the second and fourth, and which cover the whole length of each of the whirls.

The opening is almost circular, yet the vertical is greater than the transverse diameter. The lip is slightly thickened, not acute; the columella, which is hardly distinct from the lip, joins the superior termination of the aperture under a slightly acute angle.

The columella termination of the lip partially covers a very small umbilicus. The length of fully developed shell is 14, its breadth 11 lines. (*Valenciennes*.)

Paludina carinata, VALENCIENNES, in Humboldt and Bonpland (1833), Rec. d'Obs. II, 252, pl. lvi, f. 2, *a b*.—KÜSTER, in Chemn., ed. 2, p. 28, pl. vi, f. 6, 7.—HALDEMAN, Mon., p. 27, pl. viii (1841).

Paludina multicarinata, HALDEMAN, Mon., pt. 4, p. 4 of cover.

Figure 23 is a fac-simile of that of Valenciennes, whose description is copied above. Prof. Haldeman suggests the name *multicarinata*, as the name *carinata* has also been used by Swainson.

Vivipara cyclostomatiformis, LEA—Shell subcylindrical, rather thick, pale horn color, smooth, imperforate; spire exserted, at the apex rose colored and obtuse; sutures very much impressed; whirls five, rounded; aperture small, nearly round, within salmon colored.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith, Dr. Jay, L. W. Sloat, and Dr. Foreman. Diam. .32, length .82 of an inch.

This is a very remarkable species, assuming very much the form of an exserted *Cyclostoma*. A single, somewhat worn specimen only, was received. The aperture is rather more than one-third the length of the shell. Its subcylindrical form is very remarkable.

Since the above description was written, Dr. Jay and Dr. Foreman have placed in my hands specimens from the same locality. The epidermis is perfect, and they are of a greenish horn color. The interior of the aperture is bluish, while the apex is slightly salmon colored. (*Lea*.)

Paludina cyclostomatiformis, LEA, Tr. Am. Phil. Soc. IX, pt. i, p. 23, 1844; Obs. IV, 23; Proc. II, 83, (1841).

Paludina contorta, SHUTTLEWORTH, of KÜSTER in Chemn, ed. 2, p. 20, pl. iv, f. 7-9 (1852).

Paludina Elliotti, LEA, Proc. Acad. Nat. Sc. Phila. 1858, p. 166.

The outline of the back of the shell reminds one of the Cuban *Megalomastoma*. The three upper whirls are sometimes of a very light flesh color, contrasting with the dark green of the remainder. The peristome is sometimes continuous, being appressed to the body whirl, and forming a rimate umbilicus. On some specimens I have detected minute revolving lines.

Pal. elliotti is a finer, better developed form of the species than that described as *cyclostomatiformis*, and has carinated upper whirls. A careful examination of Mr. Lea's types leads

Fig. 24.



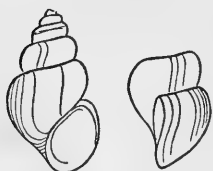
Vivipara cyclostomatiformis.



me to consider them identical. With his original description of the latter I have given figure 24 from his type, while below will be found the description of *Pal. Elliotti* and a figure (25) of a specimen presented me under this name by Mr. Lea and now in the Smithsonian collection.

I have seen no authentic specimen of *Pal. contorta*, but believe a study of Küster's description given below, and the copy of his figures (fig. 26) will convince one of its identity with Mr. Lea's shells.

Fig. 25.

*Vivipara ellioti*.

Paludina Elliotti, LEA, (l. c.)—Shell subcarinate, pyramidal, rather thick, greenish-olive, smooth, very narrowly umbilicated; spire elevated, subacute, flesh-colored at the apex; sutures excavated; whorls 7, rounded, obtusely carinated above, rather small; aperture subrotund, small, white within.

Othcalooga Creek, Ga. Bishop Elliott. (Lea.)

Paludina contorta, SHUTTLEWORTH, (l. c.)—Shell non-rimate, cylindrically conic, subovate, shining, greenish with olive lines; apex eroded; whorls 6, strongly convex, divided by a deep suture, the middle ones carinated in the middle; aperture oblong, white; peristome straight, acute, curved above.

Fig. 26.

*Paludina contorta*.

Shell smooth, cylindrical-conic, turretted with a truncated apex; shining, green, with olive brown lines and striae; sutures deep; whorls 6, ventricose, moderately increasing above, rapidly so towards the base, the middle ones clearly carinate in their centre, with brown angular curving striae and lines at the middle keel; last whorl shorter than the penultimate, and near the upper portion of the aperture separated so as to form a deep groove of

the suture. Aperture longitudinally rounded, inner lip appressed; peristome straight, acute, twisted above (fig. 9), curving again below its centre, beautifully rounded below and regularly blending with the columella. Height 8''' , breadth 5''' .

Alabama (Rugel), coll. Charpentier. (Küster.)

Fig. 27.

*Paludina subcarinata*.

Vivipara subcarinata, SAY—Shell with three whorls, which are rounded, and subcarinated, reticulated with striae and wrinkles, sometimes without the striae; suture deeply impressed; apex truncated and re-entering; aperture more than half of the length of the shell, oval; elevated lines or subcarinae on the body two, three, and sometimes none. Length half of an inch, breadth four-tenths.

Inhabits with the preceding species. (Delaware River.)

Animal viviparous, with a chestnut, coriaceous operculum, white, spotted with orange; head pale orange, not extending beyond the shell; tentacula darker, short, subulate; eyes situated at their base, elevated, black and conspicuous; base of the animal much advanced, broad, truncate, purplish before, tail rounded behind.

Paludina subcarinata, SAY, 1816, Nich. Enc. pl. i, f. 7 (*Limnæa* of earlier ed.); ed. BINNEY, p. 47, pl. lxi, f. 7.—HALDEMAN, Mon., p. 8, pl. ii (1840).—DE KAY, N. Y. Moll., p. 86 (1843).—CHENU, Conch. Ill., pl. i, f. 6-8.—PHILIPPI, Conch. II, 135, pl. li, f. 7.—KÜSTER, in Chemn., ed. 2, p. 29, pl. vi, fig. 10-14.—Not of POTIEZ ET MICHAUD.

Paludina sulculosa, MENKE, Syn. Meth. p. 134.

Paludina bicarinata, POTIEZ ET MICHAUD, Gal. des Moll., I. 249, pl. xxv, f. 17, 18.

Helix decisa, WOOD, Cat. Suppl. vii, f. 17 (1828).

Fig. 28.



Vivipara subcarinata.

There are in the mature perfect shell 3 more whirls than the number given by Mr. Say. It is a very variable shell. The whirls are sometimes truncated at the apex, very much rounded and hardly marked by the carinæ (fig. 28), which in other localities are much developed, continuing to the sharp, well defined

Fig. 29.



Vivipara subcarinata.

apical whirls, on which is no trace of erosion (fig. 29). Sometimes there is a prominent revolving elevated ridge below the carina on the body whirl. The revolving striæ are sometimes very strongly marked.

The lingual organ is figured by Troschel (Gebiss der Schnecken, p. 100, pl. vii, f. 5).

The great peculiarity of the species is its operculum, which in the young shell is subspiral, while the later growth is concentric as in the other species.

I have received specimens from Ohio, Indiana, Kentucky, Pennsylvania, and New Jersey.

Paludina sulculosa, Menke, l. c., appears to me to be this species. I have seen no authentic specimen. His description is as follows:—

Paludina sulculosa.—Shell ovate-conoid, apex deroded; imperforate, thin, decussately striated, transversely lightly sulcated; green; whorls 4, angulated on the spire; suture deep; aperture ovate; lip simple. Length $4\frac{1}{2}$, breadth 3 lines.

Ohio River at Cincinnati. Bescke. (*Menke*.)

Fig. 30.



Operculum of
Vivipara subcarinata.





Paludina bicarinata, Potiez and Michaud, is certainly this species, as shown by their description and the copy of the outline of their figure given below.

Paludina bicarinata, Por. et MICH. (l. c.) not SAY.—Shell oval, ventricose, brown or greenish, covered with numerous transverse ridges, two of which are more developed on the last whirl, the other whirls having but one medial carina; spire comprised of three or four convex whirls, of which the first are usually truncate; aperture ovoid; peristome simple. Length 42–45, breadth of last whirl 10–12 mill.

Fig. 31.

*Paludina
bicarinata.*

Mr. Say and Ch. des Moulins have both given the same name to two different shells belonging to this genus, consequently it becomes necessary, in order to avoid confusion, to change that of Des Moulins, being posterior to Mr. Say's. Moreover, M. des Moulins' shell having three carinæ, will be better designated by the name *tricarinata*, adopted in this catalogue.

Delaware River, N. America. (*Potiez et Michaud.*)

Fig. 32.

*Paludina
decisa.*

I give also an outline of Wood's figure (fig. 32) of *decisa*, of which no description is given, though it is specified as "tawny Delaware."

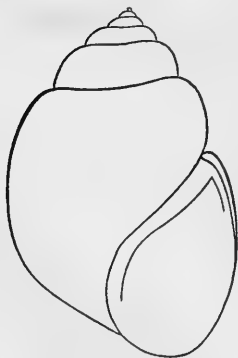
In addition to the above fac similes I have given one of Say's figures in Nicholson's Encyclopedia (fig. 27.)

§ 3. *Shell simple.*

a. *Elongate ovate.*

Vivipara ponderosa, SAY—Shell somewhat ventricose, much thickened, olivaceous or blackish; spire not much elongated, much shorter than the aperture, eroded at tip, but not truncated; whirls five, slightly wrinkled across; suture profoundly impressed; aperture subovate, more than half the length of the shell; labium with much calcareous deposit, and thickened into a callosity at the superior angle; within tinged with blue.

Fig. 33.

*Paludina ponderosa.*

Inhabits Ohio River.

Greatest length, one inch and 11-20. Transverse diameter one inch and 1-10.

This shell is common at the falls of the Ohio, and is a very remarkably thick and ponderous species. It bears a striking resemblance to *P. decisa*, and has, without doubt, been generally considered as the same; but

it differs from that species in being much more incrassated and heavy; and although much decorticated and eroded upon the spire, the tip is not truncated. In the labrum also is a distinctive character; by comparison this part will be perceived to be less arcuated in its superior limb than the corresponding part in *decisa*.

This shell is common in many parts of the Ohio as well as its tributaries. In its full grown state it is very thick and ponderous, enlarging so much in its body whirl, as to appear very different from the young shell. In the early stages of growth it resembles *P. decisa*, Nobis, from which indeed the back view would hardly distinguish it; but a sufficiently distinctive character resides in the lower part of the labium, which in the *decisa* is not obviously produced, whereas in the present species it is considerably advanced, as in many species of *Melania*, to which genus it is closely allied. (*Say.*)

Paludina ponderosa, SAY, 1821, J. A. N. S. II, 173; Am. Conch. III, pl. xxx, f. 1; ed. BINNEY, p. 68, 184, pl. xxx, f. 1.—HALDEMAN, Mon. p. 13, pl. iv (1840).—DE KAY, N. Y. Moll. p. 86 (1843).—DESHAYES in LAM. ed. 2, VIII, p. 516 (1838); ed. 3, III, p. 455, excl. *P. decisa*.—KÜSTER in Chemnitz, ed. 2, p. 14, pl. iii, f. 1-4, p. 20, pl. iv, fig. 6.—SOVERBY, Gen. of Shells, f. 2.—CHENU, Man. de Conch. I. 310, fig. 2206 (*Melantho*): Illust. Conch. pl. i. f. 14-15.—PHILIPPI, Conch. III, 3, pl. i, f. 16.

There are microscopic revolving lines upon the whirls, and the callosity at the superior angle of the aperture is sometimes developed sufficiently to make quite a fissure between it and the lip, as in *Lithasia*.

I have often received young specimens as *Pal. regularis*. Other specimens are very difficult to separate from *Viv. decisa*.

Paludina maxima, Ravenel (Cat.) may be this species. No description was published.

I have received specimens from Ohio, Indiana, Illinois, Michigan near Lake Superior, Tennessee, and Alabama.

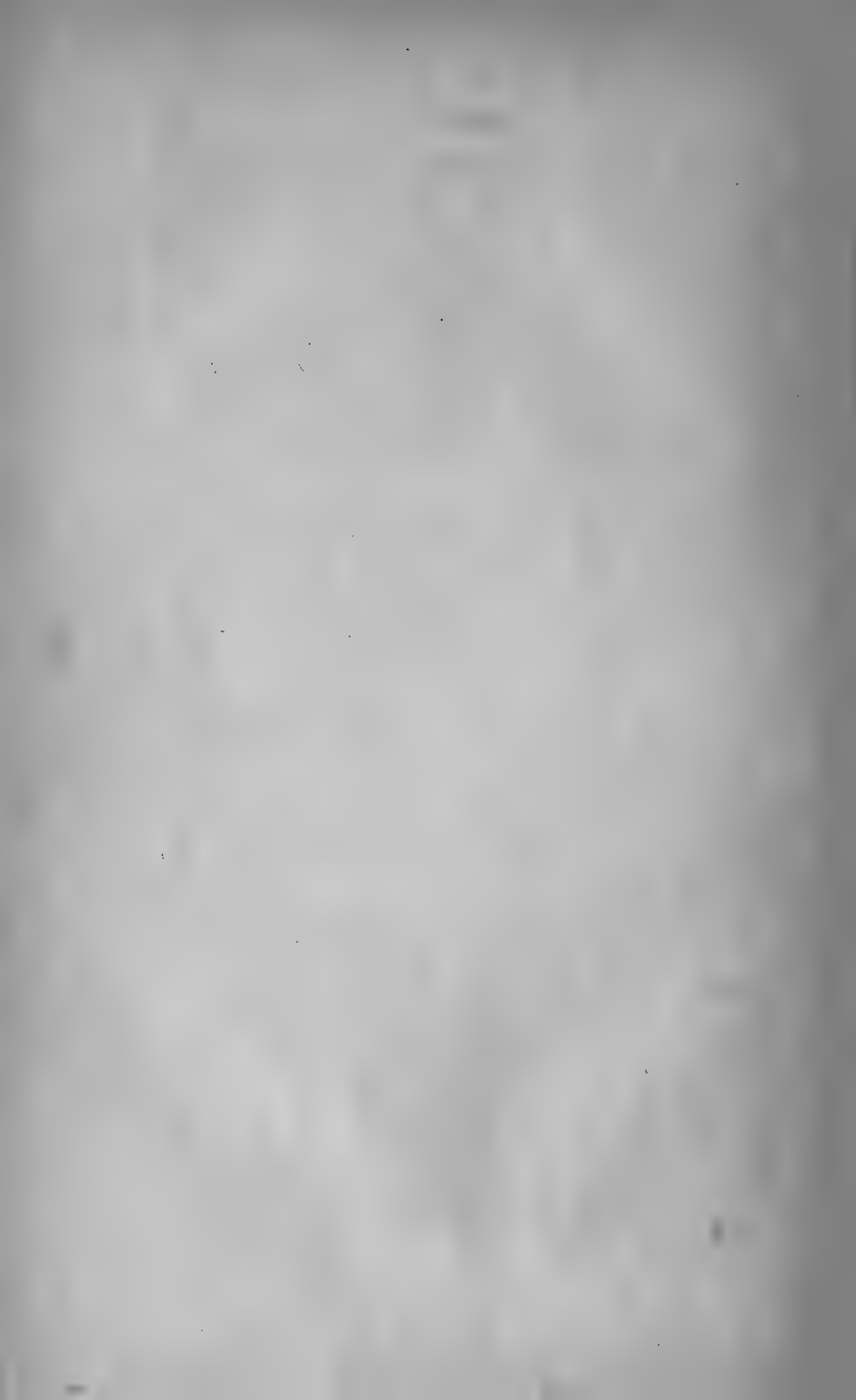
A fac-simile in outline of one of Mr. Say's figures is given (fig. 33). His figure of *Pal. decisa* in the American Conchology seems rather to represent this species (fig. 34).

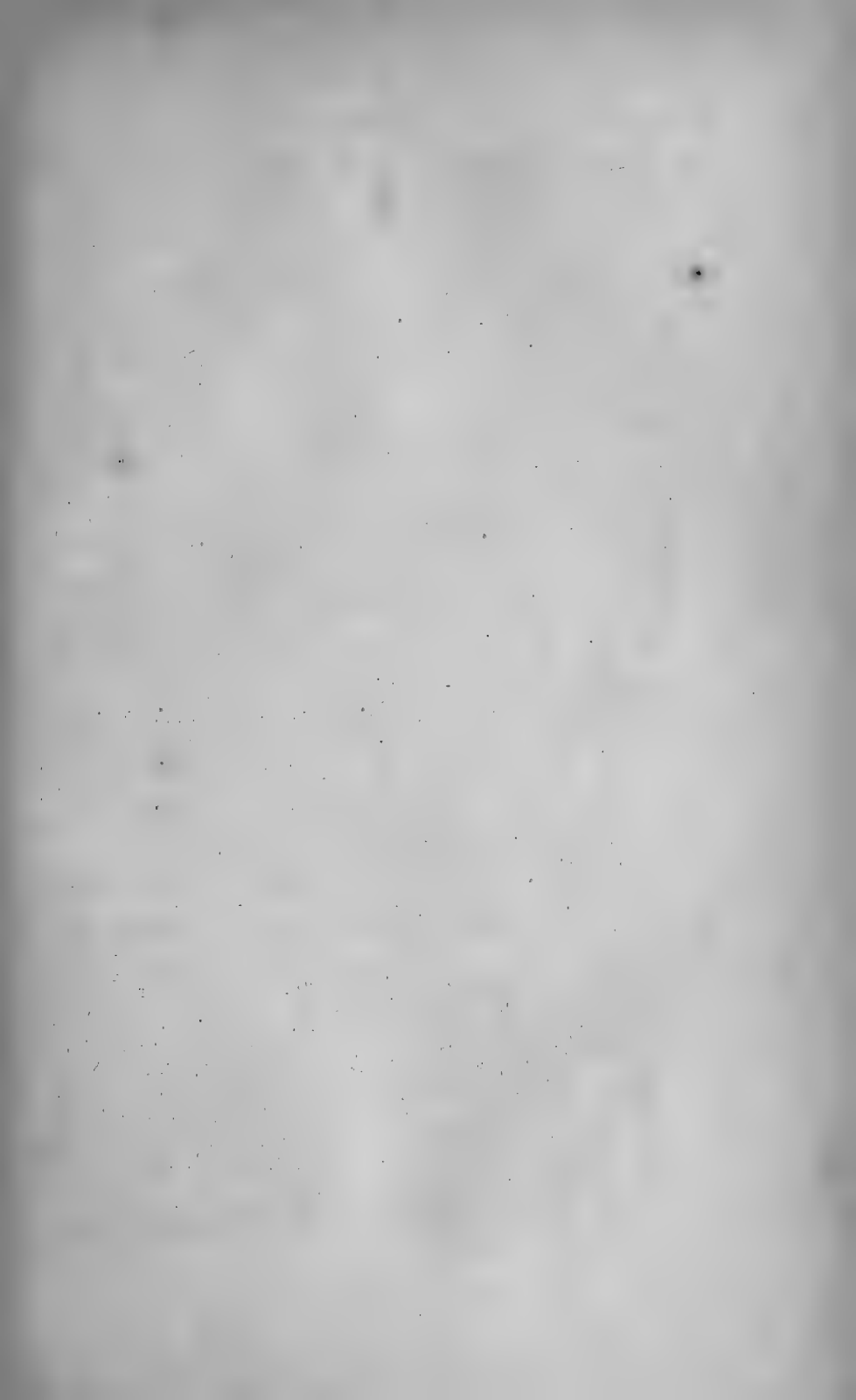
Haldeman mentions a var. A, "not exceeding an inch in length; the transverse wavy striæ are obsolete; the spire is low, and truncate-eroded, and the labium very much thickened posteriorly, from the Alabama River."

Dr. Showalter sent me numerous specimens from the Coosa River.

Fig. 34.

*Paludina decisa*.





Vivipara decisa, SAY—Shell subconic, olivaceous, truncated at the apex; whirls four, wrinkled across and banded with minute distant striæ; terminal whirl very short; suture impressed and conspicuous; aperture subovate, more than half of the length of the shell, entire; within bluish-white. Operculum coriaceous, elevated on the disk and concentrically striated. Length one inch, breadth three-fourths.

Fig. 35.

*Paludina decisa*

Cochlea virginiana é flava viridescens, non fasciata.

LISTER, Conch. tab. cxxvii, fig. 27.

The young shell resembles *P. subcarinata*, but the whirls are destitute of an elevated line, the suture is not so deeply impressed, and the aperture is narrower above.

Animal with the foot larger, suddenly a little dilated each side before and truncate in front, widely; foot livid, thickly maculated with irregular orange spots, which are much smaller beneath; head and tentacula spotted with orange; eyes on a prominent angle, at the external base of the tentacula.

I found the animal viviparous in October; the young shell had then three complete whirls, which were spirally striated. (Say.)

Paludina decisa, SAY, 1816. NICHOLSON'S Encycl. pl. iii, f. 6 (*Limnæa* of earlier editions); Amer. Conch. I, pl. x.; ed. BINNEY, p. 49, 159, pl. x, fig. 1, pl. lxx, fig. 6.—PHILIPPI, Conch. III, 3, pl. i. f. 8.—HALDEMAN, Mon. p. 4, pl. i (1840).—GOULD, Invert. of Mass. 222, wood-cut, p. 144 (1841).—ADAMS, Hist. of Vermont, p. 151.—DEKAY, N. Y. Moll. p. 84, pl. vi, f. 131; vii, 134 (1843).—CHENU, Ill. Conch. i, f. 1-5.—MRS. GRAY, Fig. Moll. An. pl. cccx, f. 10.—POTIEZ et MICHAUD, Gall. des Moll. I, 247, pl. xxv, f. 13, 14.—KÜSTER in Chemn. ed. 2, p. 13, pl. ii, fig. 14-19.

Melania ocularis, MENKE, Syn. Meth. p. 134, teste KÜSTER.

Paludina limosa, VALENCIENNES, Rec. d'Obs. II, p. 253, 1839, teste KÜSTER and HALDEMAN.

Paludina ponderosa jun., DESHAYES in LAM. VIII, 516 (1838), ed. 3, III, 455.

Paludina heterostropha, KIRTLAND, Ohio Rep. p. 175 (1838).—TAPPAN, Am. Journ. XXXV, p. 269, pl. iii, p. 2, 1839.

Paludina microstoma, KIRTLAND, Ohio Report, p. 175 (1838).

Paludina rufa, HALDEMAN, Mon. III, p. 3 of wrapper, pl. iii, f. 1 (1841).

Paludina cornea, VALENCIENNES? Rec. d'Obs. II, p. 255, 1833.

Paludina integra, SAY, 1821, BINNEY'S ed. p. 69; Journ. A. N. Sc. II, 174.—HALDEMAN, Mon. p. 10, pl. iii (1840).—ADAMS, Hist. of Vermont, p. 152.—DEKAY, N. Y. Moll. p. 84, pl. vii, f. 132 (1843).—KÜSTER, Chemn. ed. 2, p. 17, tab. iii, f. 11-13.—CHENU, Ill. Conch. pl. i, f. 9-13.—PHILIPPI, Conch. III, 4, pl. i, f. 7.

Paludina genicula, CONRAD N. Fr. W. Shells, p. 48, pl. viii, fig. 3, 1831.—KÜSTER in Chemn. ed. 2, p. 14, pl. iii, fig. 5, 6 (1852).—MÜLLER,

Syn. Test. in 1834 prom. p. 39.—HALDEMAN, Mon. p. 15, pl. v (1840).

—DEKAY, N. Y. Moll. p. 86 (1843).—CHENU, Illust. Conch. pl. i, f. 18-19.

Paludina heros, DEKAY, N. Y. Moll. p. 85.

Paludina subsolida, ANTHONY, Proc. Ac. N. Sc. Phila. 1860, p. 71.

Helix dissimilis, WOOD, Ind. Suppl. pl. vii, f. 18 (1828).

Lymnula ventricosa, RAFINESQUE, MSS.

Ambloxis (Amblostoma) major, RAFINESQUE, MSS.

Cochlea Virginiana &c., LISTER, Conch. t. cxxvii, f. 27 (1770).

PETIVER, Gazophyl. t. cvi, f. 18.

Mr. Say makes no mention, in his description, of the minute revolving lines which characterize the species. Fig. 35 is a facsimile of his figure 6, published in Nicholson's Encyclopedia, and represents the true *decisa*. Fig. 34 is copied from the figure of the American Conchology, which appears to me rather a small specimen of *Viv. ponderosa*. It certainly has no truncated apex.

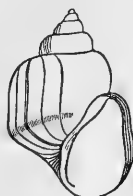
The animal of this species is given in figure 18, copied from Haldeman's Monograph.

In many specimens there is a thickening as in *Lithasia*, which is also often present in individuals of *Viv. ponderosa*. Among the curious abnormal forms which have come under my view, and which seem referable to *V. decisa*, or the form called *integra*, are some on which the columellar callus is not appressed in its whole breadth to the body whirl, but, standing out from it, makes the peritreme almost continuous. No. 8903 of the collection has a revolving band; No. 8877 is reversed, which is rare in adult specimens, though the young more frequently furnish examples of it. One has the aperture 20 and the entire shell 45 mill. long, the suture deeply impressed, the whirls below it abruptly shouldered, the shoulders of the upper whirls worn away so as to make the top of each whirl completely flat and forming almost a right angle with its sides. In globoseness or narrowness, of the whirls it is extremely variable.

To the kindness of Dr. James Lewis I am indebted for the opportunity of figuring several shells which appear to be abnormal forms rather than constant varieties. (Figs. 36, 37.)

I have drawn up the synonymy of this species after a careful study of a large number of individuals from numerous different localities. The Smithsonian series alone is derived from fifty

Fig. 36.



Vivipara decisa,
deformed.

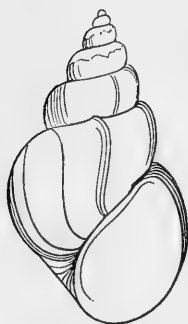




separate points of the country, and contains two hundred and two specimens selected from a quantity laid aside as duplicates. The number examined from other sources is certainly equal to this. I now proceed to treat at length each of what I consider synonyms.

Pal. integra, Say, as seen from the description furnished below, is distinguished from the typical *decisa* by having a perfect apex. I do not find this character constant, *i. e.*, in many lots from the same locality I can detect some with a perfect apex, though the majority are truncated. In the Delaware at Burlington, however, it is not rare to find a perfect specimen. I notice quite a difference in the amount of erosion of this and other species, dependent on locality. Thus, I find *Melania virginica* with the apex alone eroded within only one hundred yards of another locality, where almost every individual has every whirl so much eroded that it is difficult to find any of the outer surface to examine. In addition to this fact of the amount of erosion of some truncated species

Fig. 37.



Vivipara decisa,
deformed.

being somewhat dependent on locality, is the fact of other species being found sometimes eroded and in other places never so, and yet no one would presume to found on this circumstance specific distinction. For example, *Viv. subcarinata*, though always truncated in the Delaware, is found in some western localities with a beautifully defined apex, (see figure under that species). *Viv. ponderosa* also, though generally perfect, is found in some of the Alabama rivers constantly decollate. It seems to me, therefore, that we must found the specific characters, if existing, on other points than the erosion

of the apex. I have not been able to find such. The same sculpturing is present in each form; the same tendency to variation in outline, &c. I give the original description of *Pal. integra* below, and a figure (38) of a specimen deposited by Mr. Say in the collection of the Philadelphia Academy of Natural Sciences. The dimensions given by Say are supposed by Halde-
man to be a typographical error.

Paludina integra, SAY.—Shell olivaceous, pale, conic; whirls six, wrinkled across; spire rather elongated, entire at the apex; suture profoundly

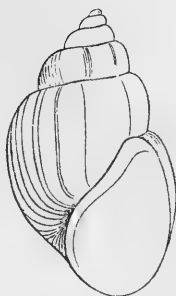
indented; aperture subovate, less than half of the length of the shell.

Inhabits the waters of the Missouri. Length $\frac{1}{4}$ inch.

Very much resembles *P. decisa*; the spire, however, is more elongated, and never truncated at the apex, but always acute. (*Say.*)

I put *Melania ovularis*, Mke., in the synonymy on the authority of Küster (Chemn. ed. nov.), who so quotes it. I have seen no authentic specimen.

Fig. 38.

*Paludina integra.*

Melania ovularis, MENKE, (l. c.)—Shell ovate-conoid, truncate, substriate, shining, greenish, reddish-brown when old, truncated at apex; aperture ovate, columella subcallous above; aperture rounded before.

Length 1 inch; breadth 7 lines.

Hab.—Near Cincinnati, in the Ohio River. Bescke. (*Menke.*)

Paludina limosa, Valenciennes, is considered a synonym by Haldeman and Küster. I have seen no authentic specimen.

Paludina limosa, VALENCIENNES (l. c.)—Shell ovate-conic, thin, subdiaphanous, green; whorls 5, longitudinally striate; labrum acute.

Paludina limosa, SAY, Journ. Phil. I, 125.

This *Paludina* is less globose and longer than that of our climate. The height at the last whorl is a little less than of the others. Its breadth is greater than its length, and its surface is covered with somewhat strong longitudinal striæ. The form of the aperture is also more oval. Its vertical diameter is the longest.

The lip is sharp, continued to the columella, which is not appressed.

The shell is not very thick; there are, however, some individuals which are eroded like some of the bivalve shells.

The apex is destroyed as the animal grows, and a flat circular partition is formed, having the axis of the shell in its centre, in about the same manner as in *Bulinus decollatus*.

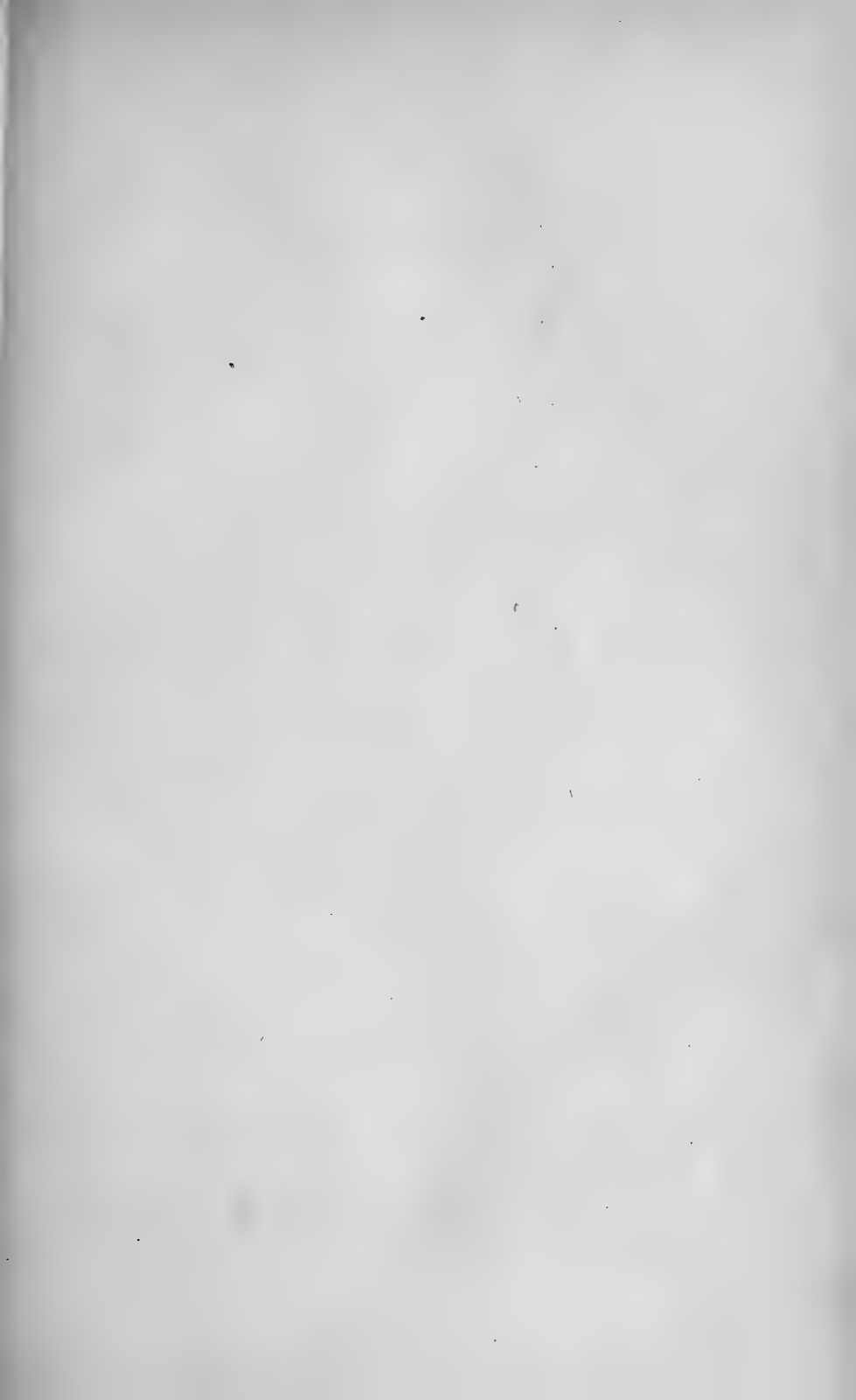
I saw one individual whose three apical whorls were destroyed so as to give a broken appearance to the shell.

Length rather more than one inch. (*Valenciennes.*)

The following also is cited doubtfully as a synonym by Haldeman. I have seen no specimen.

Paludina cornea, VALENCIENNES (l. c.)—In the Delaware and many other rivers of the United States there is found a horn-colored *Paludina*, which at first sight resembles the *Pal. limosa*, but which a more careful examina-





tion proves to be sufficiently distinct to form a new species. On account of its color I call it

Paludina cornea.—Shell ovate-conic, thin, opaque, greenish horn color; whirls 5, subrounded; sutures deeply impressed.

This species has an obtuse apex; the last whirl is one-third longer than the others; each of them has a kind of flattening (aplatissiment) which forms a balustrade (rampe) around the spire, whose sutures are deeply impressed. The striæ of growth are vertical and fine. The aperture is oval. Horn colored, with a greenish tinge; the interior of the mouth and lip is white.

The largest individual was 11 lines in length. (*Valenciennes*.)

Paludina heterostropha of Kirtland's Ohio Report is referred by Gould (Boston Proc. I, 32) to *Viv. ponderosa*. Judging from the figure given of it by Tappan, I would rather refer it to *decisa*. This figure is copied in my fig. 39, while the description furnished Tappan by Dr. Kirtland is as follows:—

Paludina heterostropha, KIRTLAND, l. c.—Sinistral; aperture more than half the length of the shell. Shell subglobose, ovate; spire depressed, apex generally truncate; whirls 5; aperture ovate, with its superior extremity curved towards the body whirl, within bluish-white; epidermis greenish horn color, usually coated with ferruginous clay. Length $\frac{3}{4}$ inch.

Fig. 39.



Paludina heterostropha.

This shell frequently occurs in Mill and Yellow Creeks, tributaries of the Mahoning River. I formerly considered it a mere variety of *P. decisa*, Say; but on further examination found it to be specifically distinct. It never attains more than half the length of that species; its spire is never depressed, and it is always heterostrophal. (*Tappan*.)

Paludina microstoma, Kirtland, is added to the synonymy on authority of Mr. Anthony, who tells me Prof. Kirtland described it before meeting with the description of *integra*. On seeing Mr. Anthony's cabinet he was at once convinced of their identity.

Fig. 40.



Paludina rufa.

Paludina microstoma, l. c.—An undescribed species of *Paludina*, found frequently associated with the *P. decisa*, and distinguished by its elongated spire and small mouth. (*Kirtland*.)

Paludina rufa, Haldeman, is said by him (l. c.) to be distinguished by a reddish color and entire apex, but may be a variety of *Pal. decisa*. The reddish or pinkish tint within the aperture (sometimes divided into bands) appears to distinguish this form of the species, which occurs

in the Southern as well as Northern States. Prof. Haldeman's original specimen of *Pal. rufa*, together with all those from which the plates of his Monograph were drawn, are deposited by him in the collection of the Academy at Philadelphia. Fig. 40 is a fac-simile of the figure referred to by Haldeman under this name. No. 8905 of the collection represents it.

Fig. 41.

*Helix dissimilis.*

Figure 41 is a fac-simile of *Helix dissimilis*, Wood, of which no description nor locality is given. It is evidently intended for this species, though the true name *decisa* is applied by Wood to a figure of *subcarinata*. I also give a fac-simile (fig. 42) of Lister's figure.

Fig. 42.



Fig. 43.

*Paludina obesa.*

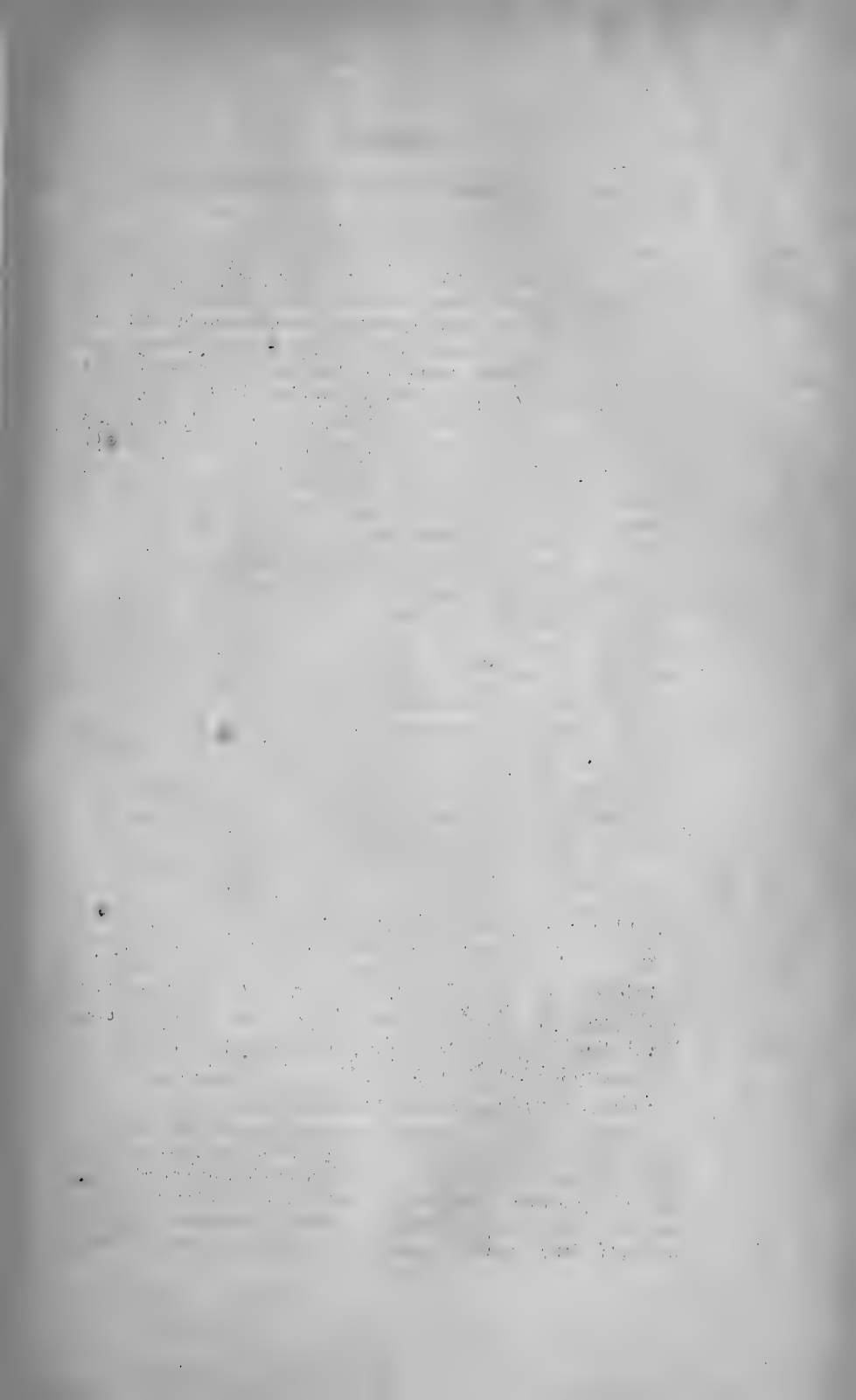
No. 8921-4 of the collection were presented by Dr. James Lewis under the unpublished name of *Paludina obesa*, Lewis. Fig. 43 represents one of them. This form is a well marked variety, found near Mohawk, N. Y., in Ohio, and Michigan. It is readily distinguished by its very ventricose, rounded form and dark olive green color. Some small specimens resemble forms of *V. regularis*, Lea. Its name is preoccupied.

The fac-simile which I have given of Haldeman's figure, drawn from the original specimen of *Paludina genicula*, Conrad (fig. 44), would not lead one to consider that species identical with *Viv. decisa*. I do not, however, hesitate to unite them; my opinions are founded on an examination of a series of shells from the locality which furnished Mr. Conrad's specimen, which show a gradual series from the rounded whorls of the *decisa* to the angular form of *genicula*, though none of the shells were as well marked as that figured. From other localities, also, I have received specimens of *decisa* whose six whorls were quite as angular and scalariform. I suppose Higgins refers to some such in quoting *Pal. genicula* from the Ohio and Scioto Canal. In Küster's *Paludina* (Chemn. ed. 2), Cedar Creek is also given as a locality

Fig. 44.

*Paludina genicula.*





for *genicula*. Mr. Conrad's description is as follows. Fig. 45 is a fac simile of his.

Fig. 45.

*Paludina genicula*.

Paludina genicula.—Shell suboval, spire slightly elevated; volutions 4, scalariform, shoulders angulated; apex eroded, aperture rather more than half the length of the shell; epidermis green olive; within bluish.

A species which is readily distinguished from those nearest allied to it by the angulated whirls. I found a single specimen in Flint River, Ga. (Conrad.)

Lymanella ventricosa, Rafinesque, of whose description and figure (fig. 46) a copy is here given, is evidently this species. His figure, though very rough, is quite characteristic.

Fig. 46.

*Lymanella ventricosa*.

Lymanella ventricosa.—Whirls 4, last one very large; form obtuse-oval; aperture bluntly oval, &c. (Rafinesque.)

Fig. 47.

*Lymnea eburnea*, Raf.

From the same MS., "Conchologia Ohioensis," which was kindly loaned me by Prof. Haldeman, I find rough figures (fig. 47) of *Viv. decisa* under the name of *Ambloxis*, *Amblostoma*, or *Lymanulus major*, Rafinesque, or *Lymnea eburnea*, Rafinesque. All these names are given, and I find it impossible to decide which was the one finally fixed upon, or to decipher more of the description than the following:—

Whirls 5, last very large, form obtuse oval, aperture obtuse oval, lip thickened within, columella covered with callus. (Rafinesque.)

Paludina subsolida, Anthony, appears to me also a synonym of this species. My opinion is founded on an examination of Mr. Anthony's specimen, kindly lent me for figuring (fig. 48). His description here follows.

Paludina subsolida, ANTHONY.—Shell ovate, imperforate, very thick; color light green, verging to brown in old specimens; spire much elevated, composed of 6—7 inflated whorls; sutures very distinct; aperture broad-ovate, about one-third the length of the shell, within white; lip curved forward and forming a very conspicuous, subacute tip near its base; columella well rounded, a thick callous deposit covering the umbilicus. Length 2 inches, breadth $1\frac{1}{4}$ inches.

Illinois. My cabinet; cabinet of Hugh Cuming, London.

This is the most ponderous species in the genus, far exceeding *P. ponderosa*, Say, in that respect; compared with that species it is not only much more solid and heavy, but its spire is proportionally more elongate, whirls more convex, while the body whirl is less ventricose, and the aperture is uncommonly small for a *Paludina* of its size; the body whirl is disposed to be angulated near its middle; all the whirls are more or less shouldered and the lines of growth are very conspicuous; the body whirl is obscurely striate concentrically, and its surface thereby modified so as to present a faintly sculptured appearance, and the striae being somewhat finely undulated the appearance under a microscope is very pleasing. (Anthony.)

Paludina heros, DeKay, of one of the earlier Zoological Reports of New York is said by that author to be a large form of *Pal. integra*. (N. Y. Moll. p. 85.)

Of the forms generally known as *Pal. decisa* and *integra* I have received specimens from Maine, lat. 47° (Morse), vicinity of Montreal (Mrs. T. P. Girdwood), Ohio, Illinois, Michigan, Iowa, Wisconsin, Kansas, Missouri, Mississippi, Tennessee, Texas, Alabama, Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania, New Jersey, New York, and all the New England States. It appears a widely distributed species, and may be said to inhabit the whole continent, east of the Rocky Mountains and Rio Grande, to the boreal regions.

Since writing the above, I have received from Mr. E. S. Morse, of Portland, Me., drawings of the lingual membrane of the form known as *Viv. integra*, received from Dr. J. Lewis, of Mohawk, N. Y. I give below the drawing and Mr. Morse's notes.

"*Vivipara-integra*.—Lingual membrane composed of forty-eight rows of teeth, arranged in the form common to the group 3, 1, 3. Central tooth broad, short, and hooked, a small shoulder each side near its base; first lateral broad and hooked; second and third lateral-long, claw-shaped; anterior part of membrane broad, narrowing toward

Fig. 48.

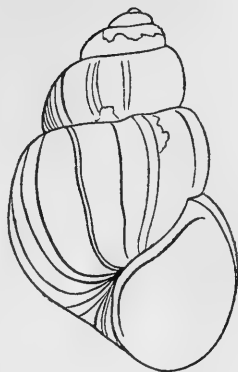
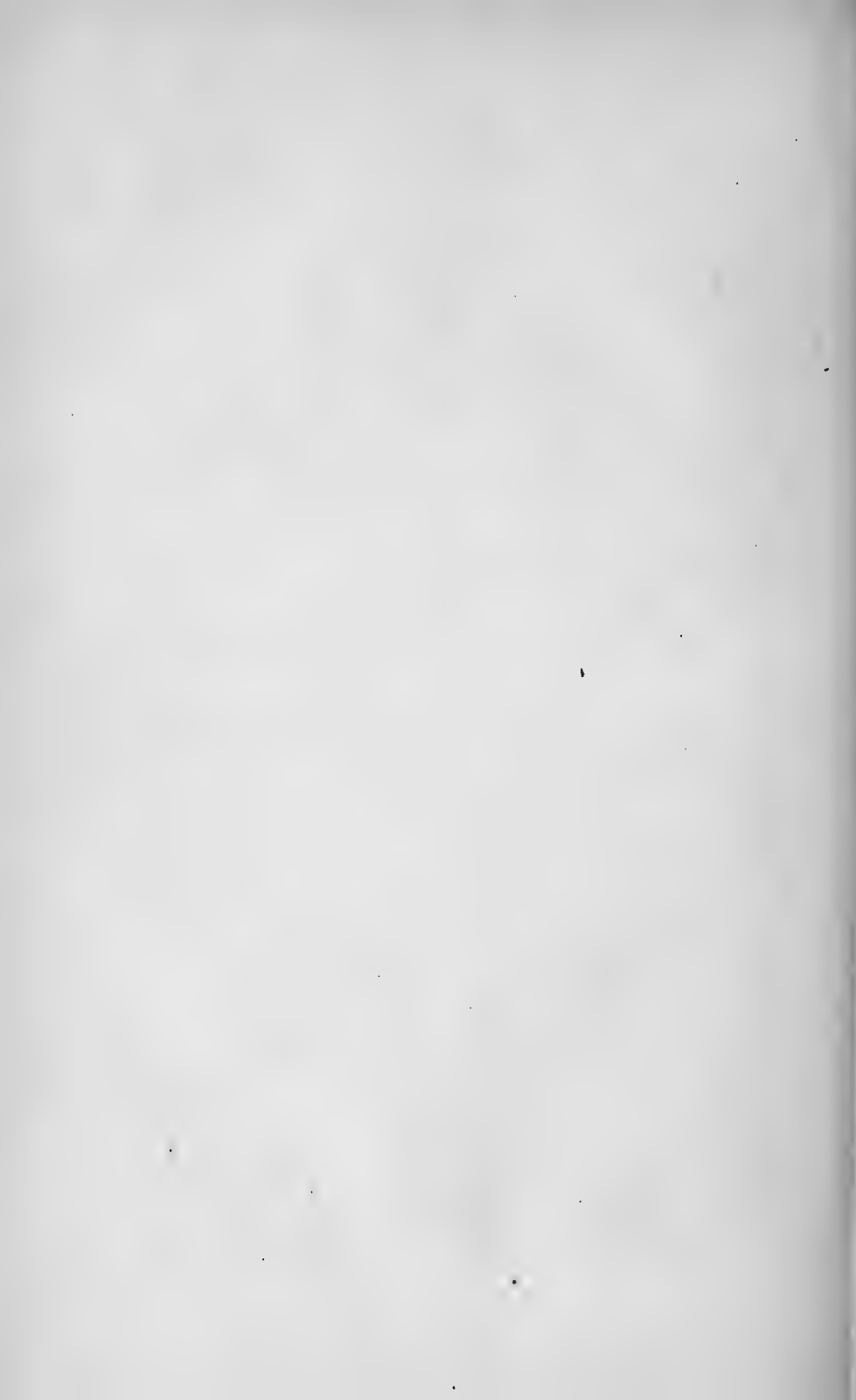
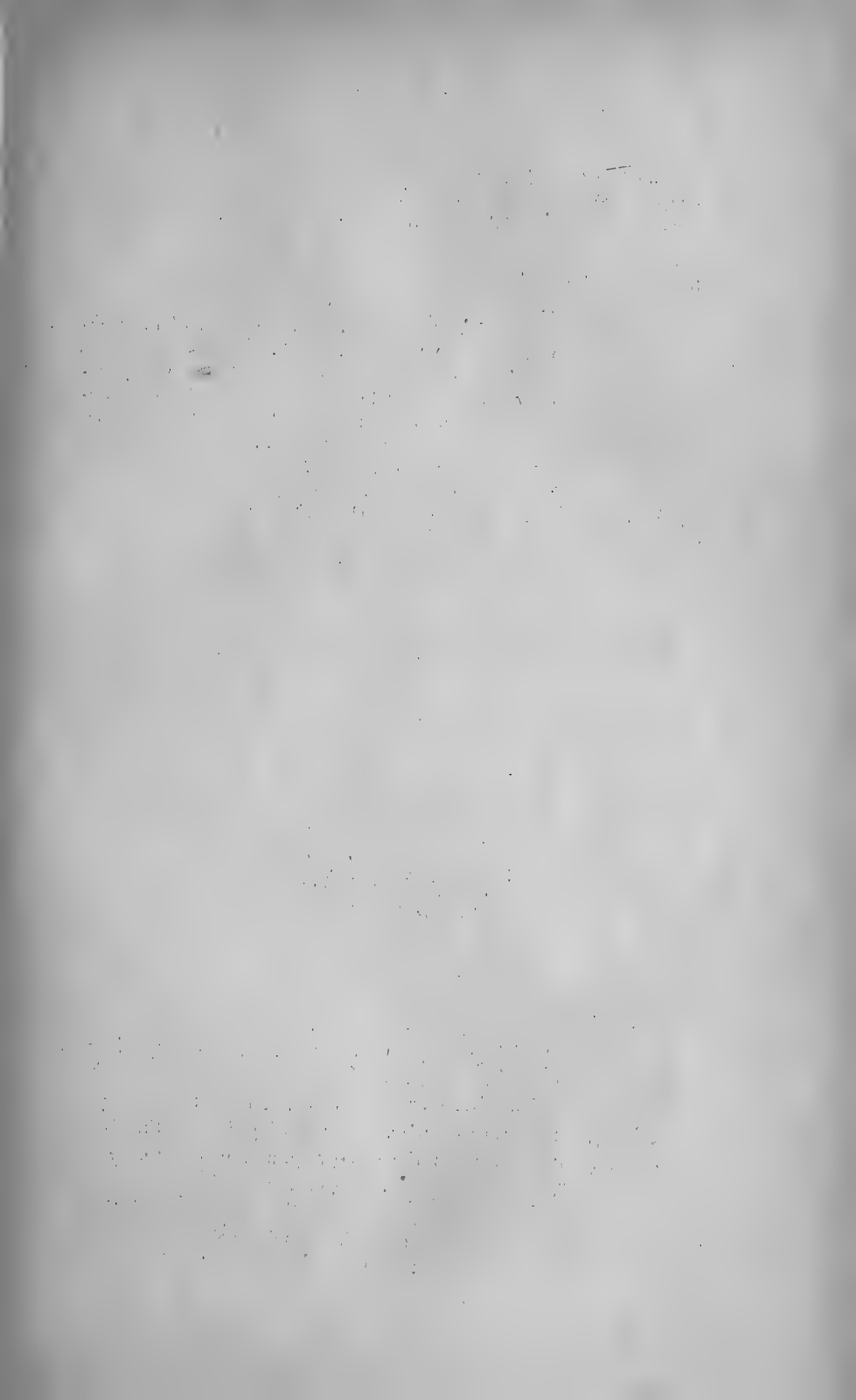
*Paludina subsolida.*

Fig. 49.

Lingual dentition of *Vivipara integra*.





the middle, and again widening at its posterior portion. First twelve or fourteen rows translucent brown in color, the rest colorless.

"This specimen was filled with fully developed young."

Vivipara coarctata, LEA—Shell smooth, ovate, compressed, thick, imperforate, olive color; spire drawn out; sutures much impressed; whorls flattened; aperture rather small, ovate, white.

Fig. 50.



Vivipara coarctata.

Alabama. E. Foreman, M. D. Cabinet of Dr. Foreman. Diam. .50, length .98 inch.

This species, of which a single specimen only was received, differs from all of the genus which has come under my notice. It is remarkable for its compressed form, the body whorl being quite flattened. The apex is eroded, which prevents the number of whorls being ascertained: there appear to be five. The aperture is less round than usual in this genus, and may be rather more than half the length of the shell. (Lea.)

Paludina coarctata, LEA, Tr. Am. Phil. Soc., IX, 30 (1844); Obs. IV, 30; Proc. II, 243 (1842).

Paludina lima, ANTHONY, Proc. Acad. N. S. Phil. 1860, p. 70.

Paludina exilis, ANTHONY, Proc. Acad. N. S. Phil. 1860 p. 71.

Paludina compressa, LEWIS in Sched. (Unpublished.)

Having before me the original specimens of *Pal. lima* and *exilis*, kindly loaned me by Mr. Anthony, and one determined by Mr. Lea to be his *Pal. coarctata*, I cannot hesitate in uniting them under one specific name, which, of course, will be the earliest published. No. 8867 of the Smithsonian collection is also a specimen of the same, though presented by Dr. J. Lewis under the unpublished name of *Pal. compressa*, Lewis.

As Mr. Lea's original specimen is imperfect, I have added to the figure of it (Fig. 50) one of a perfect specimen from his collection (Fig. 51). I am able also, to add figures of the shells from which Mr. Anthony drew his description of *Pal. lima* (Fig. 53) and *exilis* (Fig. 52). The latter shell is rather more slender than the other forms, one specimen being only thirteen mills. wide, though thirty-one long.

Fig. 51.



Vivipara coarctata.

The striae or growth, very much decussated by revolving deep cut lines, distinguish all the forms mentioned in the synonymy, and constitute one of the chief characteristics of the species.

In addition to the localities given in the various descriptions, I have received the shell from Natchez, Jackson, Mississippi, and

a form with three revolving raised lines or keels, from Pulaski County, Arkansas.

Paludina exilis, ANTHONY, (l. c.)—Shell turreted, smooth, rather thick; color light apple-green; spire elevated, composed of about seven volutions; suture well marked; aperture small, broad-ovate, livid within; body whirl distinctly angulated, subumbilicate, and with very distinct lines of growth; columella well rounded and curved with a callous deposit, connecting perfectly with the outer lip, thus forming a continuous rim.

Length, $1\frac{1}{4}$ inch; breadth, $\frac{3}{4}$ inch.

Hab.—Mississippi. My Cab.; Cab. H. Cuming, London; A. N. S. Philadelphia; State collection, Albany, N. Y.; Smithsonian collection.

Obs.—One of the most slender of our American species; *Paludina subsolida*, nob., is more ponderous, more globose, and has a larger aperture; no other species approaches it in general appearance; the whirls of this species taper more rapidly to an acute apex than in most of the species; compared with *P. integra*, Say, it is more slender, more solid, and the aperture is much smaller. (Anthony.)

Fig. 52.

*Paludina exilis.*

Fig. 53.

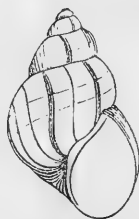
*Paludina lima.*

Paludina lima, ANTHONY, (l. c.)—Shell ovate, rather thin, dark green; spire obtusely elevated and composed of six convex whirls, which are strongly striate or subcarinate; sutures very distinct, and the upper part of each whirl being flattened renders it more conspicuous; aperture broad-ovate, about half the length of the shell, livid within; columella slightly rounded and callous deposit small; umbilicus none.

Length, $1\frac{1}{4}$ inch; breadth, $\frac{3}{4}$ inch.

Hab.—South Carolina. My Cab.; Cab. H. Cuming, London; A. N. S., Philadelphia; Smithsonian collection, Washington, D. C.

Fig. 54.

*Paludina lima.*

Obs.—In general form not unlike our western *P. integra*, Say, from which it differs, however, by its revolving, raised striæ and by its carinæ, which are also well developed; the lines of growth are very strong, and decussating with the striæ give the surface a beautifully rough appearance, which suggests its specific name. It is really one of our handsomest species, and so unlike all others that no American species can readily be mistaken for it. In most specimens the body whirl is very strongly carinate about the middle, and the outer lip is considerably produced as in *P. subsolida*, nob. (Anthony.)



Vivipara subpurpurea, SAY.—Shell oblong, subovate, olivaceous, with a tinge of purple more or less intense, sometimes hardly perceptible; spire rather obtuse, terminating convexly; whirls five, wrinkled, equally convex; suture impressed, but not very profoundly; aperture much widest in the middle, narrower above; within glaucous, somewhat perlaceous; labrum rectilinear from the middle upwards; umbilicus none. Length about one inch, greatest breadth four-fifths of an inch.



Paludina subpurpurea.

An inhabitant of Fox River, an arm of the Wabash. It is very distinct from any other species I have seen. The labrum exhibits no curvature from the middle almost to its junction with the penultimate volution.

Shell subglobular oval, not remarkably thickened; spire longer than the aperture, entire at the tip; whirls five, slightly wrinkled across, rounded but not very convex; penultimate volution somewhat elongated; suture impressed; aperture ovate-orbicular, less than half the length of the shell; labium with calcareous deposit; animal very pale bluish, with minute yellow points, particularly on the rostrum, tentacula, and prominent respiratory tube, which is as long as the tentacula; eyes on the exterior side of the tentacula, near the middle of their length; the anterior portion of the foot is very short.

This species was first found by Mr. Lesueur and Dr. Troost, in Fox River of the Wabash. In the young state the figure is subglobose, and the aperture, although it hardly differs in form from that of the adult, is yet longer than the spire. They become proportionally more elongated as they advance in age, and the form, therefore, of the adult, is so different from that of the young or half grown, that in these states it may, very readily, be mistaken for a widely distinct species.

The color of the shell is variable. In some it is pale horn, more tinged with yellowish than with green; in others are traces of obsolete purplish bands; in many specimens the whole shell is reddish-purple, more or less obscure in different individuals.

In the autumn it is frequently found between the valves of dead Unios, in which it enters perhaps to hybernate. The species is certainly allied to the *vivipara*, but it cannot well be mistaken for it, as it is much less dilated, the volutions less convex; the penultimate volution is much longer in proportion to the length of the body whirl, and the umbilicus is obsolete. (Say.)

Paludina subpurpurea, SAY, 1829; N. H. Diss. II, 245; Am. Conch. III, pl. xxx, f. 2; BINNEY'S ed. p. 146, 185, pl. xxx, f. 2.—HALDEMAN, Mon. p. 28, pl. ix, 1841.—DEKAY, N. Y. Moll. p. 86 (1843).—KSTÜER, Chemn. ed. 2, p. 12, pl. ii, fig. 10-13; pl. vii, fig. 3-5.

Vivipara Texana, TRYON, Pr. Ac. Nat. Sc. (fig.), Oct. 1862.

Mr. Say's original specimens of this species are still preserved in the collection of the Philadelphia Academy. Fig. 56 is taken from one of them.

The surface is often quite smooth and shining, the spire more or less elongated and slender, but always distinguished by the penultimate whirl, which is very much larger than is usual in our *Viviparæ*, and when seen from behind, appears remarkably bulging at its upper portion. Fig. 55 is copied from one of Mr. Say's figures.

In the description of the animal Mr. Say speaks of a tubular cylindrical organ as a respiratory syphon, but Haldeman suggests its being probably the outlet of the viscous glands.

A specimen in Mr. Anthony's cabinet measures in extreme length 33, last whirl 19, penultimate 8, antepenultimate $2\frac{1}{2}$ mill., the measurements being taken on the front of the shell.

I have traced this species from Texas through Louisiana and Mississippi to Key West, Florida, and in the Western States of Indiana, Wisconsin, and Missouri.

A more elongated, slender form of the species, which is common in the southwest, from Mississippi to Texas, has been described by Mr. Tryon as a distinct species under the name of *V. Texana*. A careful examination of the specimen from which his diagnosis is drawn, as well as the large series in the Smithsonian collection, leaves no doubt in my mind of its identity. The original description and figure are given below.

Vivipara Texana.—Shell solid, conic, light green colored; spire elongate, suture deeply impressed, apex obtuse; whirls 6, slightly convex; aperture small, suborbicular, equalling two-fifths the shell's length.

Texas. Coll. Acad. Nat. Sciences; Coll. G. W. Tryon, jr.

Shell solid, narrowly conic, consisting of six whirls, which are somewhat flattened around the upper half of their breadth; suture well marked; aperture suborbicular, equalling two-fifths of the length of the shell; umbilicus covered; epidermis light green with faint red revolving bands.

This shell resembles most the *V. subpurpurea*, Say, but is easily distinguished by having six whirls, which are much narrower than in that spe-

Fig. 56.

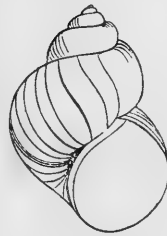
*Vivipara subpurpurea*.

Fig. 57.

*Vivipara texana*.

cies. The spire is also almost double the length of that of *subpurpurea*, and the epidermis of a lighter color. (*Tryon*).

Vivipara incrassata, LEA—Shell smooth, elliptical, rather thin, imperforate, dark horn color; sutures somewhat impressed; whirls somewhat convex; columella thickened above; aperture rather round, small, within bluish.

Fig. 58.



Paludina incrassata.

Alabama. E. Foreman, M. D. Cabinet of Dr. Foreman. Diam. .52, length . . . inch.

Rather more than the first whirl only of the specimen before me is perfect, and I would not have proposed it for a new species, but that this part differs from any which has come under my notice. The callus on the superior part of the columella is very like that we find in the genus *Anculosa*. The aperture is smaller than usual in this genus. The upper whirls being decollate, neither their number nor the form of the spire can be given. (*Lea*.)

Paludina incrassata, LEA, Tr. Am. Phil. Soc. IX, 30 (1844); Obs. iv, 30. Proc. ii, 283 (1842).

The figure given above (fig. 58) is taken from Mr. Lea's original specimen. I have not seen others.

Paludina vivipara, SAY—Shell subconic, with six rounded whirls; suture impressed, color olivaceous or pale, with three red-brown bands, of which the middle one is generally smallest, whirls of the spire with but two; aperture suborbicular, more than half the length of the shell.

It is doubtful whether or not this is the same as the *vivipara*, but it certainly approaches very near to it; we, however, refer it to that species until a specific difference can be indicated, which at present we are unable to do; the spire of this species is rather more obtuse, and the suture not so deeply impressed, as in the figures of the European specimens above mentioned.

DONOV. Brit. Shells, tab. lxxxvii, *Helix vivipara*.—LISTER, Conch. tab. cxxvi, fig. 26; *Cochlea vivipara fasciata*.

This appears to be one of the many species that are common to North America and Europe. And though the specimens from the two continents differ a little, yet this difference is so slight as not to be specific. Cuvier remarks that "the female produces living young, which are found in its oviducts, in the spring, in every state of development. Spallanzani assures us, that the young, taken at the moment of their birth and nourished separately, reproduce without fecundation, like those of the *Aphis*. The males are nearly as common as the females; their generative organ is inserted and retracted, as in *Helix*, by a hole pierced in the right tentaculum,

which causes this tentaculum to appear larger than the other. By this character the male is easily known."

The *vivipara* is far less common than the *decisa*, and seems to be more usually found in the southern part of the Union. Mr. Elliott of Charleston sent me two specimens from the banks of St. John's River, Florida, and Capt. Leconte presented me with one, which he obtained at Lake George on the same river. Pl. 10, the two middle figures exhibit the brownish banded var.

- Paludina vivipara*, SAY (*Lymnæa*), 1816. Nich. Encycl. pl. ii, f. 5. Am. Conch., pt. 1, pl. x. BINNEY'S ed. p. 48, 159, pl. lxx, f. 5.—HALDEMAN, Mon. p. 17, pl. vi (1841).—DEKAY, N. Y. Moll., p. 86 (1843).
Paludina lineata, VALENCIENNES, Rec. d'Obs. II, 256, 1833.—KÜSTER, Chemn. ed. 2, p. 10, pl. ii, f. 6-9 (1852), p. 19, pl. iv, fig. 4.
Paludina Georgiana, LEA, Tr. Am. Phil. Soc. V, 116, pl. xix, fig. 85, date of title 1837. Obs. ii, p. 228.—HALDEMAN, Mon. p. 23, pl. vii, f. 1, 2 (1841).—KÜSTER, in Chemn. ed. 2, p. 15, pl. iii, f. 7, 8 (1852).—DEKAY, N. Y. Moll. p. 86 (1843).—CHENU, Man. Conch. I, 310, fig. 2207 (*Melantho*); Illust. Conch. pl. i, f. 20, 21.—PHILIPPI, Conch. iii, 4, pl. i, f. 15.

A very variable species in the variety of arrangement of the revolving bands, sometimes quite wanting, as well as in the greater or less elevation of the spire, and globoseness of the whirls. Figs. 59, 62, represent two forms.

Widely distributed, having been noticed along the south shore of Lake Michigan, in Indiana, Illinois, Missouri, Arkansas, Alabama, Georgia, South Carolina, and Florida.

Authors have doubted the identity of this with the European species whose name I have adopted. I cannot distinguish some native from some foreign specimens when laid side by side.

My opinion on *Pal. Geor-*
giana is based on an examination of Mr. Lea's specimens. His description is given below, and an outline of his figure, (Fig. 64), as

well as that of Haldeman, which was drawn from the type (63).

Fig. 59.

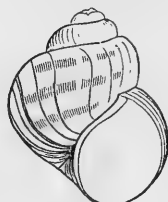
*Vivipara vivipara.*

Fig. 62.

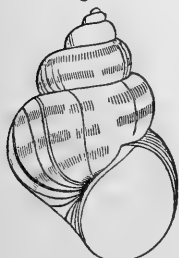
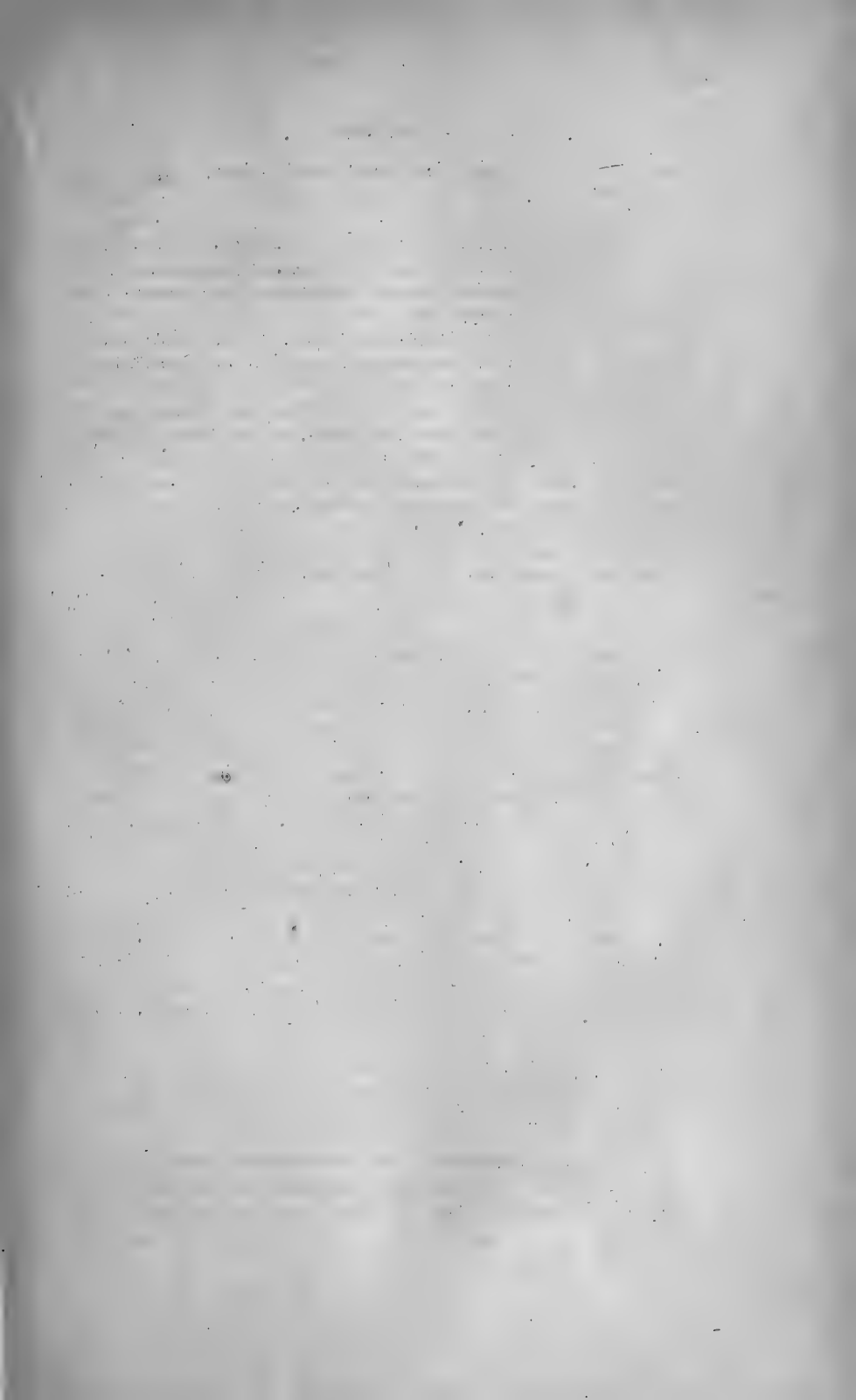
*Vivipara vivipara.*

Fig. 63.

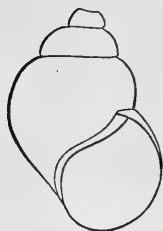
*Paludina Georgiana.*





No. 8854 of the Smithsonian collection, was labelled *Pal. Georgiana* by Mr. Lea.

Fig. 64.



Paludina Georgiana.

Paludina Georgiana, LEA—Shell ventricose-conical, thin, dark horn-colored, smooth; sutures very much impressed; whirls about five; convex; aperture nearly round, white.

Hopeton, near Darien, Ga. Prof. Shepard; my cabinet; cabinet of Prof. Shepard. Diameter .7, length 1.1 inch.

This species in form resembles most, perhaps, the *P. vivipara*. It is not quite so large, nor has it bands. It is rather more elevated, and the body whirl is smaller and rounder than the *P. decisa*, Say.

The aperture at the base recedes more than is usual with the genus. (*Lea.*)

Of *Pal. lineata* the following is the original description:—

Paludina lineata, VALENCIENNES—This species resembles that of the Seine. It is equally ventricose, but has a thinner shell. Shell ventricose-ovate, thin, diaphanous, with delicate transverse striæ; greenish horn-color, with numerous transverse greener vittæ. Whirls five, last one large, ventricose, and equalling in height one-half the entire length of the shell. Besides the striæ of growth, there are numerous transverse, very fine lines. The whirls are not flattened towards the moderate suture. Apex acute. Color green, sometimes somewhat corneous ground, on which are a large number of bands of a deeper green and variable width, sometimes merely linear. On the upper whirls the bands are obsolete. Apex not eroded in any of a large number of individuals.

Operculum brown, thin, horny, covered with numerous concentric, not spiral, lines. Found in Lake Erie by M. A. Michaud, who found one shell full of young, as in the case of our species, which proves the species to be viviparous. There is reason to believe the other species also are so, though in the most natural genera species vary in being both oviparous and viviparous. The genera of colubers and vipers among the reptiles are an example of this, while the Mollusca furnish more numerous ones.

Length 1 inch 3 lines. (*Valenciennes.*)

§ 4. *Shell simple.*

b. *Globose.*

Vivipara intertexta, SAY—Shell subglobose, yellowish-green or brownish, wrinkled, and with minute, very numerous, obsolete revolving, deciduous lines; spire depressed conic, obtuse, truncated, eroded at tip;

volutions nearly four; suture rather deeply indented; umbilicus closed by the lateral extension of the columella.

Greatest breadth, from four-fifths to one inch; length, about the same. Inhabits Louisiana.

We collected many of the shells in the marshes near New Orleans and on the banks of the Carondelet canal. It is remarkable for its globular form and for the numerous obsolete lines which seem like equidistant deciduous corrugations of the epidermis, having no effect whatever in modifying the calcareous surface, upon which it exhibits no trace. In good specimens two or three obsolete, pale bands are visible by transmitted light.

Paludina intertexta, SAY, 1829, New Harmony Diss. II, 244; Am. Conch. 3, pl. xxx, f. 3, 4; BINNEY'S ed. p. 146, 185, pl. xxx, f. 3, 4.—HALDEMAN, Mon. p. 31, pl. x, f. 1—6, 1841.—DEKAY, N. Y. Moll. p. 85 (1843).—PHILIPPI, Conch. II, 8, pl. ii, f. 4.—KÜSTER in Chemn., ed. 2, p. 16, pl. iii, f. 9, 10* (1852).

Paludina transversa, SAY, N. H. Diss. II, 245, 1829; BINNEY'S ed. p. 145.—DEKAY, N. Y. Moll. p. 85 (1843).

Ampullaria (?) *intertexta*, HALDEMAN, Mon. Ampullaria, p. 11.

In addition to Mr. Say's localities, I have received it from Grand Coteau, St. Laundry Parish, La. (*Blanc.*) Also from South Carolina. (*Ravenel.*) Very globose specimens of *Viv. vivipara* sometimes are readily confounded at first glance with this species. They are umbilicated.

One of Mr. Say's figures is copied above (fig. 65). Fig. 66 represents the front view of a more perfect specimen.

Mr. Say's type of *Pal. transversa* is still preserved in the Cabinet of the Philadelphia Academy. It is evidently a young *V. intertexta*. His description follows, with a view of his type (Fig. 67).

Paludina transversa, SAY—Shell transverse, depressed, orbicular; spire convex; whirls three and a half, with numerous minute, slightly elevated revolving lines; suture not widely indented; body whirl very convex, short; umbilicus small; operculum pale fulvous.

Greatest width, two-fifths of an inch. Inhabits Louisiana.

We obtained two specimens in the marshes near New Orleans. It is much wider in proportion to the length than any other species I have seen, exceeding in this respect even *M. subglobosa*,

Fig. 65.

*Paludina intertexta.*

Fig. 66.

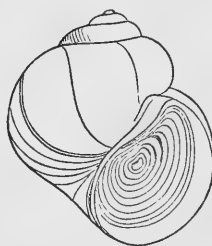
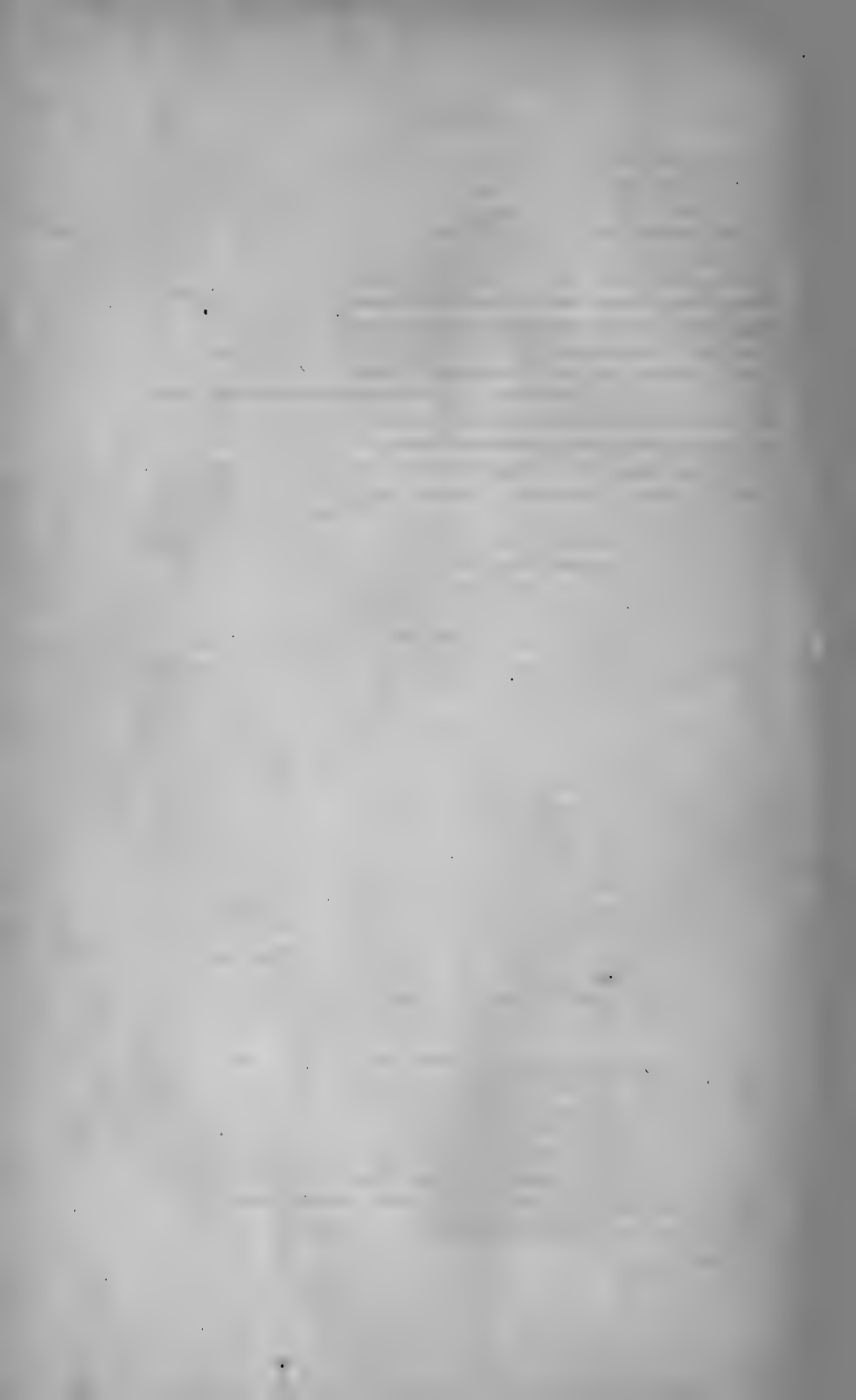
*Vivipara intertexta.*

Fig. 67.

*Paludina transversa.*

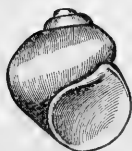


nob., and especially *P. intertexta*, nob., of which latter, in fact, I at first supposed it to be the young, in consequence of its rotundity and the similarity of its capillary lines; but inasmuch as the number of its whirls is nearly the same, whilst the magnitude differs so greatly, I have separated it as a different species.

Vivipara troostiana, LEA—Shell ventricose-conical, thin, pellucid, yellowish horn color, smooth, perforate; spire short; sutures very much impressed; whirls four, convex; aperture large, rounded, white.

Tennessee. Prof. Troost. My cabinet, and cabinet of Prof. Troost. Diam. .68, length .72 inch.

Fig. 68.



Vivipara troostiana.

This is a subglobose species, differing from any which has come under my notice, in having the superior portion of the last whorl somewhat flattened, giving the shell a somewhat gibbous appearance. The operculum is rather of a light color, and the plane of the aperture is very retuse at its base. It has a strong resemblance to *P. unicolor* (Lamarck), and perhaps a stronger one to *P. Maheyana* (Grateloup). It is more depressed in the spire than either, and the perforation is smaller than in the former, while it is nearly the size of that in the latter. The aperture is larger than either. Dr. Grateloup has very properly, I think, separated the Malabar species from that which was observed by Olivier in Egypt, and called *unicolor* by Lamarck. The Egyptian shell has a larger perforation, is darker in color, and is a larger species. I call this after my friend Prof. Troost. (Lea.)

Paludina troostiana, LEA, Tr. Am. Phil. Soc. IX, p. 14 (1844). Obs. IV, p. 14. Proc. II, 34 (1841). Arch. f. Nat. 1843, II, 130.

Paludina haleiana, LEA, l. c. p. 96, pl. ix, f. 58 (1847). Obs. IV, 70. Proc. IV, 167 (1845).

I have added to Mr. Lea's description of *V. troostiana* a view of the type (Fig. 68) in his collection. It will not seem to correspond very exactly with the figure of *haleiana*, of which a facsimile in outline is given below (fig. 69). A comparison of all of Mr. Lea's specimens of each has convinced me, however, of their identity. Mr. Lea's description of the latter species here follows.

Fig. 69.



Paludina haleiana.

Vivipara haleiana, LEA—Shell smooth, ventricosely conical, rather thin, reddish horn-color, imperforate; spire short; sutures much impressed; whirls four, nearly convex; aperture large, nearly round, bluish.

Diameter .4, length .55 inch. Alexandria, La.

This species is nearly allied to the *Pal. troostiana*, nob., but is rather smaller, of a darker color, not quite so rotund, and imperforate. These differences would distinguish it

without difficulty. In the *haleiana* there is a disposition in most of the specimens to a compression below the sutures. This makes quite a shoulder at the sutures and prevents the mouth from being regular. (Lea.)

Paludina wareana, SHUTTLEWORTH (l. c.)—Shell rimately perforate, ventricose, rather thin, subopaque, with delicate concentric lines, olivaceous-ferruginous, thickly streaked with smoke color; whirls 4, inflated, sutures deep; aperture oval, white, ends joined by a thin, glassy callus; peristome straight, sharp.

Fig. 70.

*Paludina Wareana.*

Shell somewhat resembling *Pal. obtusa*, but is very truncated, rimate, perforate, ventricose, rather thin and transparent, almost opaque; striæ fine; color olive green blending with iron; surface broken by numerous curved streaks, sometimes linear, sometimes stronger; whirls 4, slightly increasing; first whirl entirely eroded, the second slightly so in the shell examined; whirls ventricose, sutures moderate; aperture ovate, much shorter than the spire, above modified by the penultimate whirl, reddish within, bluish towards the edge; parietal wall covered with a thin transparent callus; columellar slightly curved; peristome straight, acute, from below the middle to the base slightly curved. Length 9''' , breadth 7''' .

East Florida, in Lake Ware (Rugel). Coll. Carpentier (*Shuttleworth*).

Paludina wareana, SHUTTLEWORTH in KÜSTER, *Paludina* (Chemn. ed. 2), p. 21, pl. iv, f. 10-11.

I have not seen this species. Fig. 70 is a fac-simile of the outline of one of the figures referred to.

Vivipara coosaensis, LEA—Shell subglobose, thin, pale, rather smooth, perforate; spire short; sutures very much impressed; whirls five, round; aperture large, nearly round, within whitish.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith and Dr. Foreman. Diam. .58, length .62 inch.

This species is remarkable for its round whirls, its width and large deep sutures. The superior part of the whirls is somewhat flattened. The color is remarkably pale, nearly white. The epidermis is very thin, and under the lens displays very minute, rather regular longitudinal striæ crossed on the body whirl by obsolete striæ. The aperture is nearly one-half the length of the shell. (Lea.)

Paludina coosaensis, LEA, Tr. Am. Phil. Soc., IX, p. 23 (1844). Obs. IV, 23. Proc., II, 83 (1841).

Paludina magnifica, pars., HALDEMAN, Mon., pt. 6, p. 4 of wrapper.

Mr. Lea's type of this species bears but little resemblance to *V. magnifica*, yet Prof. Haldeman unites the two. I myself



Fig. 71.

*Vivipara coosaensis.*

have seen no connecting links between them, though I have examined numerous young individuals of *Viv. magnifica*.

Fig. 71 is drawn from the original specimen of Mr. Lea. No. 8949 of the Smithsonian collection was labelled by Mr. Lea.

***Vivipara decapitata*, ANTHONY**—Shell globular, thin, of a light green color; spire truncate, but never elevated under any circumstances, composed of about four very flat whorls; aperture broad, ovate, one-half the length of the shell, within dusky white; columella regularly but not deeply rounded, with a slight deposit of callous, and having a very small linear umbilicus at base.

Fig. 72.

*Vivipara decapitata.*

Tennessee. My Cabinet.

A single specimen only is before me, and therefore I claim it as a new species with some hesitation; it seems to me, however, too unlike any of the ordinary forms in this genus to warrant its being included with any of them; it is the most globose of any species hitherto published, if we except the small, round forms which were long since removed, and very properly too, to *Amnicola*; the spire is entirely wanting, but traces of the sutures show the number of whorls; and its present appearance forbids the idea of its ever having had an elevated spire. (*Anthony.*)

Paludina decapitata, АНТОНУ, Proc. Acad. Nat. Sci., Phil. 1860, p. 71.

To the copy of the description of Mr. Anthony given above, I am able to add Fig. 72, drawn from the type, which he kindly loaned me for the purpose. I do not consider this a well-established species. The single specimen on which it is founded is evidently an undeveloped specimen in a very imperfect state. The spire is eroded, the shell presents the appearance of belonging to a small ill-favored individual of *V. decisa*. However, the only information we have regarding it, given above, may serve to identify it, should it appear in future.

***Vivipara regularis*, LEA**—Shell subglobose, rather thick, greenish horn color, imperforate; spire very short; sutures impressed; whorls five, convex; aperture large, ovate, within bluish.

Ohio? T. G. Lea. My cabinet, and cabinet of T. G. Lea. Diam. .38, length .52 inch.

A very distinct species with the body whirl about four-fifths the length of the shell. The whorls are very regular, giving the spire somewhat the appearance of a coil of rope. All the specimens before me are more or

less incrustated with the oxide of iron. The aperture is inflated, and about three-fourths the length of the shell.

I am not positively sure that this species came from Ohio. By some accident the label has been misplaced, but I am under the impression it came with some other species from my brother at Cincinnati. (*Lea.*)

Paludina regularis, LEA, Tr. Amer. Phil. Soc., IX, 13 (1844). Obs. IV, 13, 1841. Proc. II, 34 (1841). Arch. f. Nat., 1843, II, 130.

From the specimens labelled by Mr. Lea in the Smithsonian collection, it does not appear to me that this species is as well characterized as the others found in this country. Still, in the present state of our knowledge of the genus, I cannot place Mr. Lea's name in the synonymy of any other species. His original specimens are much better marked. The figure is drawn from one kindly given me by Mr. Lea, and is thus characterized. The spire is extremely short, flattened, but well defined quite to the acute apex; the sutures are impressed; the body whirl comprises more than five-sixths of the complete length of the shell; the aperture is almost as long as the body whirl, and so wide that the length and breadth of the shell are almost equal; the shell is remarkably globose, almost circular. I have often met in cabinets with immature specimens of *Viv. ponderosa* under this name.

Fig. 73.

*Vivipara regularis.*

See remarks on *Pal. obesa*, under *Viv. decisa*.

Found also in Illinois and Ohio.

Vivipara subglobosa, SAY—Shell subglobose; whirls three and a half, much rounded, rapidly enlarging; suture profoundly impressed; aperture subovate; umbilicus very narrow, nearly closed by the labrum; spire very short, convex.

Fig. 74.

Inhabits the Northwestern Territory. Length less than three-tenths of an inch.

I obtained this shell when traversing the northwestern part of the Union. It is much larger than the *porata*, nob., which it resembles considerably, but its whirls are much more rapidly enlarged, and the umbilicus is much narrower.

*Pal. subglobosa.*

Paludina subglobosa, SAY, 1825, J. A. N. S., V, 125; Binney's ed. p. 115.—

DEKAY, N. Y. Moll., p. 86 (1843).—HALDEMAN, Mon., pl. x, f. 7, 8.

Say's type is still preserved at the Philadelphia Academy. Fig. 74 is taken from it. It does not appear to me to belong properly to this genus, but rather to the same group of *Leptoxis* as *L. isogona*, *pallida*, *altalis*, &c.

27
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DOUBTFUL, SPURIOUS, AND EXTRA-LIMITAL SPECIES.

This completes the list of known North American *Viviparæ*. There now follow notices of doubtful species and those which have been erroneously referred to the genus.

Vivipara alleghanensis, GREEN—Shell conical; spire elevated and rather obtuse; whirls four, rounded and nearly smooth, the ultimate whirl the largest; mouth oval, slightly angular near the upper part of the peristome, where it adheres to the body whirl; umbilicus none; epidermis dark brown color. Length two-tenths of an inch. Fine specimens of the shell are in the cabinet of Mr. W. Hyde. Moun-tains of Pennsylvania. (Green.)

Paludina alleghanensis, GREEN, in Doughty's Cabinet of Nat. Hist., II, p. 291 (1832).

The above is Green's description. I have not been able to obtain any information about the species. From the size and shape of the shell I should incline to believe it to be an *Amnicola*.

Paludina unicolor, LAM., from South Carolina, mentioned by name only by Wheatley in his Cat. of U. S. Shells, p. 30. I have never known of any such species having been found there.

Vivipara Bengalensis, LAM. *Pal. elongata*, SWAINSON—*Pal. multilineata*, SAY, BINNEY's ed., p. 146.—*Pal. vitula*, RAFINESQUE, (Bengal.) Atl. Journ., V. 169), said to have been found in St. John's River, Fla. Mr. Say's words are as follows: "Capt. Leconte presented me with a shell which, he informed me, he found in the River St. John, Florida. I described it nearly four years since under the name of *multilineata*; but, recently, being about to publish it, on a more attentive examination and comparison with a specimen of the *elongata* from Calcutta, given to me by Mr. Hyde of Philadelphia, I have concluded that it varies from that specimen only in having the umbilicus a little smaller."

See also *Ampullaria rotundata*.

I have seen some specimens said to have come from Florida which might be referred to this species, but at present cannot consider its existence there sufficiently established to admit it in the list of American *Vivipara*. Haldeman (Mon., p. 24, pl. vii, f. 3, 4, thus describes and figures it, considering it probable that it was accidentally introduced into Florida together with *Ampullaria rotundata*, Say. They are both Calcutta shells:—

Fig. 75.



*Paludina
bengalensis*.

"Shell lengthened, conic, and polished; composed of six or seven convex whirls, the surface of which is covered with minute transverse wrinkles,

and numerous narrow spiral bands; apex pointed; suture deep; lines of accretion very fine; aperture regularly rounded, produced posteriorly. Color bright green, often passing into brownish; the spiral bands are fuscous, and the inside white."

Paludina minuta, SAY, of KÜSTER, Chemn. ed. ii, p. 52, pl. x, f. 15-16, is *Cingula minuta*, TOTTEM. Mr. Say never described any such species.

Paludina hyalina, LEA (not of MORELET), is a distorted *Planorbis exacutus*, q. v.

Paludina turrita, MENKE, Syn. Meth. p. 40, is mentioned by name only, *Cyclostoma marginatum*, SAY, being mentioned doubtfully as a synonym.

Paludina aculeus, KÜSTER, Chemn. ed. ii, p. 73, pl. xiii, f. 8-9, is *Cingula aculeus*.

Paludina scalaris, JAY=*Physa scalaris*, q. v.

Paludina porata, SAY, is mentioned by name only in Menke's Syn. Meth. p. 42 (1830) with *P. katschkana*, PARR. and *P. fluminensis*, ZIEGLER, as its synonyms.

Paludina castanea, VALENCIENNES, Humboldt and Bonpland, Rec. d'Obs. II, 256, is not specified as American. The description was drawn from a specimen in the Paris Museum, locality unknown.

Paludina decipiens is mentioned by name only among the American species added to those cited in Lamarck's Animaux sans Vertebres, by Gould's translation (p. 70, Genera of Shells). I have no information concerning it.

Finding *Pleurocera* of Rafinesque quoted in the synonymy of *Vivipara* by Adams, Gen. Rec. Moll., I was inclined to place the following species in *Vivipara*, but now omit them.

Pleurocera acuta, Enum. and Acc., p. 8.

Pleurocera rugosa, " " " p. 8.

Pleurocera gonula, " " " p. 7.

Pleurocera verrucosa, Ann. of Nat., No. I, p. 11 (1820).

The genus *Pleurocera* is considered by Haldeman (Mon. of *Leptoxis* and Encycl. Icon., Baird's ed.) to be the same as *Io*, Lea, which last name not having priority of publication would be considered a synonym of *Pleurocera*. The following description of Rafinesque is translated from the Journal de Physique, &c. of Brussels, LXXXVIII, p. 423. The fac-simile fig. 76 is from a MS. work of the same author, "Conchologia Ohioensis," kindly lent me by Prof. Haldeman.

Pleurocera, l. c.—Shell spiral, oval or pyramidal, numerous rounded whirls; aperture oblong, oblique, base prolonged, twisted, narrowed above; outer lip thin, interior lip appressed to the columella, which is smooth and twisted, without umbilicus. Animal with a membranaceous operculum, proboscis-like head, inserted on the back; tentacles two, lateral, subulate, sharp, eyes at their exterior base. Family of *Turbinaceæ*.

Fig. 76.



Pleurocera.

Species numerous, of which I have already twelve, all fluviatile, from rivers and creeks. (*Rafinesque*.)

Omphemis plaioxis and *lacustris* of *Rafinesque* are mentioned by name only (*Journ. de Phys.* LXXXVIII, p. 424. The generic description is as follows:—

Shell oval; aperture rounded, lips detached, columella separated from the lower lip by a small oblong umbilicus; spire slightly oblique; animal with a membranaceous operculum, two flattened lateral tentacles, eyes at their exterior base. Family *Turbinacea*. Two species, *O. lacustris* and *plaioxis*, which is fluviatile. (*Rafinesque*.)

I take this opportunity of giving a fac-simile of a figure of the animal of *Leptoxis* as well as *Rafinesque*'s description, translated from the work referred to, p. 424. The figure (77) is copied from the same MS., written in the well-known hand of *Rafinesque*.

Fig. 77.



Animal of *Leptoxis*.

Leptoxis, l. c., differs from *Lymnula* by its oval, ventricose shell of two or three whirls; aperture oval, almost as large as the whole shell; eyes exterior. Four species, fluviatile, &c. (*Rafinesque*.)

To the genus *Amnicola* must be referred the following:—

Paludina sayana, KÜSTER, *Chemn. ed.* 2, p. 48, pl. ix, f. 30–32.

Paludina emarginata, KÜSTER, l. c. p. 50, pl. x, f. 3, 4.

Paludina cincinnatiensis, KÜSTER, = *Amnicola cincinnatiensis* of *Anthony*.

Paludina lapidaria, KÜSTER, l. c.

Paludina porata, KÜSTER, l. c. and of *PHILIPPI*.

Paludina lustrica, KÜSTER, l. c.

Paludina granosa, SAY, of *KIRTLAND'S Ohio Report*; probably *Amnicola granum*, SAY.

Paludina grana, SAY.

Paludina limosa, SAY.

Paludina nickliniana, LEA, q. v.

Paludina obtusa, LEA, q. v. (not of *TROSCHER*).

To the genus *Leptoxis* are to be referred the following species:—

Paludina nuttalliana, LEA, *Tr. Am. Phil. Soc.* VI, 101, pl. xxiii, f. 109.

(*Amnicola nuttalliana*, COOPER, *Minn. Rep.* p. 374.)

Paludina virens, LEA, l. c. VI, 91.

Paludina fontinalis, *PHILIPPI*, *Conch.* II, 5, p. 136, pl. iii, f. 9, and KÜSTER in *Chemn. ed.* 2, p. 56, pl. x, f. 27, 28 = *Leptoxis isogona*, SAY.

Paludina dissimilis, SAY (*BINNEY'S ed.* p. 48), and *POTIEZ* and *MICHAUD*, *Gal. des Moll.*

Paludina altalis *RAVENEL*, *Cat.*

Paludina isogona, *DEKAY*, *N. Y. Moll.* 85.

Paludina pallida, LEA, *Tr. Am. Phil. Soc.* VI, 22, pl. xxiii, f. 104.

Paludina crenata, SAY, is mentioned as a species of *Leptoxis* by *Dr. Brot* in his admirable "Matériaux pour servir à l'étude de la famille des

Mélaniens," p. 24. Mr. Say described no such species. Prof. Haldeman describes a *Leptoxis* under this name in the Monograph referred to by Dr. Brot.

Paludina humerosa ANTHONY, l. c.—Shell ovate, thick, bright green, imperforate; spire rather obtusely elevated, composed of about 5—6 convex whirls; upper whirls smooth, body whirl and preceding one strongly striate and granulate or subgranulate; sutures very distinct; aperture ovate, nearly one-half the length of the shell, livid within.

Length about half an inch.

Alabama. My cabinet.

A single specimen only is before me, but it is sufficiently distinct; its granulated surface and the broad shouldering of the whirls are its chief characteristics; compared with *P. genicula*, Con., it is more slender, darker in color, and its granulated surface is of itself a sufficient distinction. (Anthony.)

Paludina humerosa, ANTHONY, Proc. Acad. Nat. Sc. Phila. 1860, p. 71.

From an examination of Mr. Anthony's type I have no doubt of this being a nodulous species of *Leptoxis*, on which the nodules are slightly developed. Fig. 78 is drawn from it.

Fig. 78.



Paludina humerosa.

To the genus *Melania* are to be referred—

Paludina rudis, RAVENEL (Cat. of Cabinet, p. 12, 1834). No description was given by Dr. Ravenel, who informs me that he found the species at Danville, on the Dan River, and subsequently sent some specimens to Mr. Lea, who described them as *Melania inflata*.

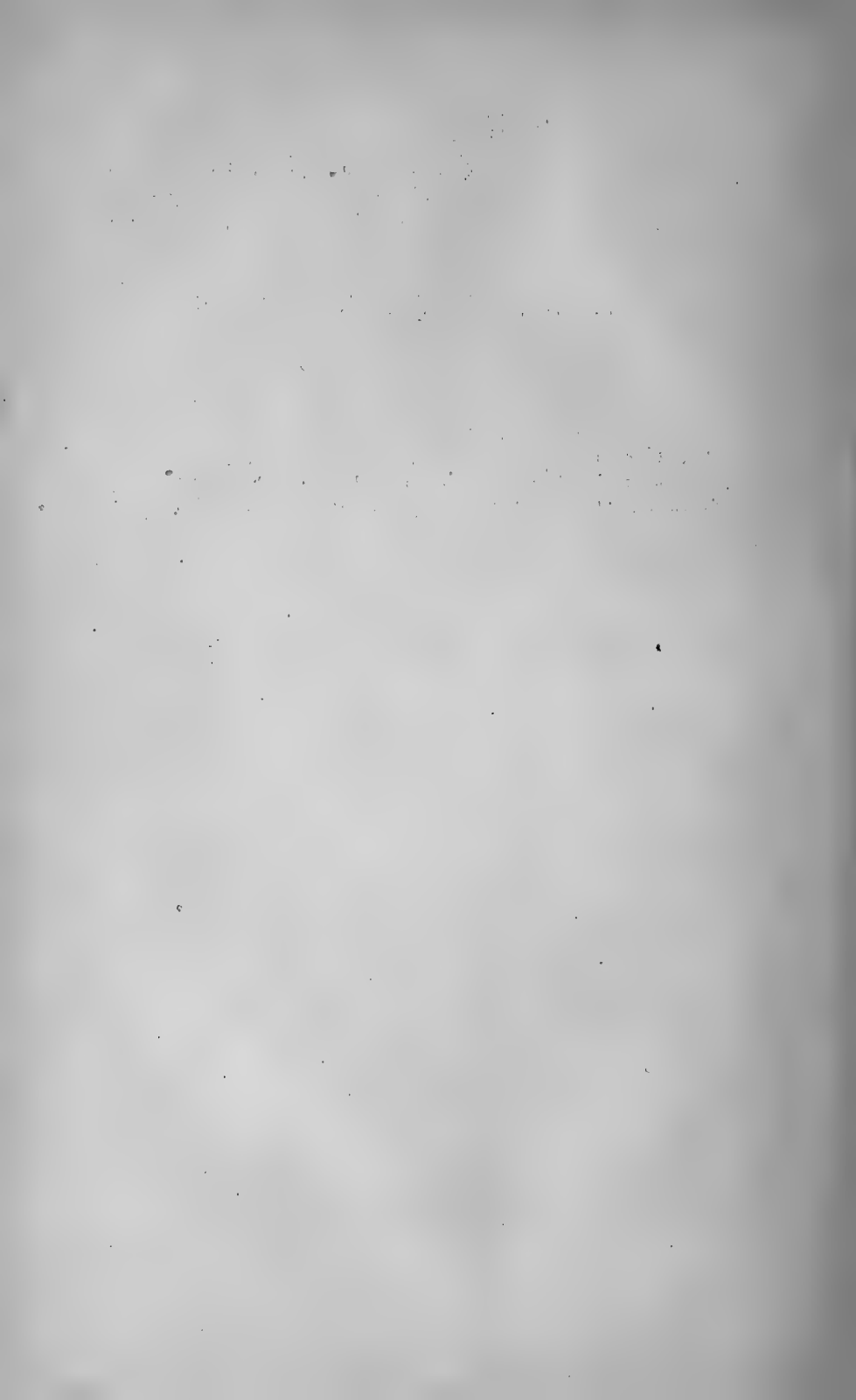
Paludina nitida, RAVENEL (Cat. of Cabinet, p. 12, 1834). No description was published. Dr. Ravenel informs me that on submitting specimens to Mr. Lea he pronounced them an undescribed species of *Melania*. They were found in the Dan River, at Danville.

To the genus *Bithynia* (q. v.) have been referred the following:—

Paludina nuclea, LEA, Tr. Am. Phil. Soc. VI, 91.

Paludina seminalis, HINDS, Voy. Sulphur.

Paludina tentaculata, LIN.



BITHYNIA, LEACH.

[Animal with a small lobe on one side of the neck. Operculum shelly on the inner surface, nucleus subcentral. Shell turbinate, covered with a horny epidermis; spire produced, whirls rounded;

peristome continuous, thickened internally. The female is oviparous, and deposits her eggs in a band, attached to stones, or to the stems of aquatic plants; when she desires to deposit the ova she seeks some smooth place and clears the surface with her mouth before commencing; the young are hatched in three or four weeks, and attain their full growth in the second year.—*H. & A. Ad.*]

Fig. 79.

*Bithynia tentaculata.*

Fig. 80.

*Pal. nuclea.*

Bithynia nuclea, LEA—Shell obtusely turreted, solid, horn color, smooth; sutures impressed; whirls 5; aperture white, oval.

Wahlamat, near its junction with the Columbia River. Prof. Nuttall. My cabinet. Cabinet of Prof. Nuttall. Diameter .2, length .4 inch.

This is a small, solid species, and is more oblique than *P. decisa*, Say. Like it, the apex is usually cut off. Round the mouth there is a black border, which contrasts with the pale horn colored epidermis. (*Lea.*)

Paludina nuclea, LEA, Tr. Am. Phil. Soc. VI, 91, pl. xxiii, f. 103.

The above is Mr. Lea's description of this species. Fig. 80 is a fac-simile of the outline of his figure. I place the species in this genus on the authority of Carpenter, Br. Ass. Rep. 1857, 326.

Fig. 81.

*Pal. seminalis.*

Bithynia seminalis, HINDS—Shell obtusely turreted, solid, horn colored, smooth; apex eroded; whirls 4; aperture bluish, expanded.

River Sacramento, California.

Distinguished from *P. nuclea*, Lea, which is from a neighboring locality, by its somewhat smaller size, bluish instead of white mouth, having one whirl less, the aperture more expanded, and absence of the black lines round the mouth, which when present is so good a character in his shell, but which, in any numerous specimens of it, I do not find at all constant, and usually only to be seen

in those better developed. *Anodon angulatus* is also found abundant in this river, &c. (*Hinds*.)

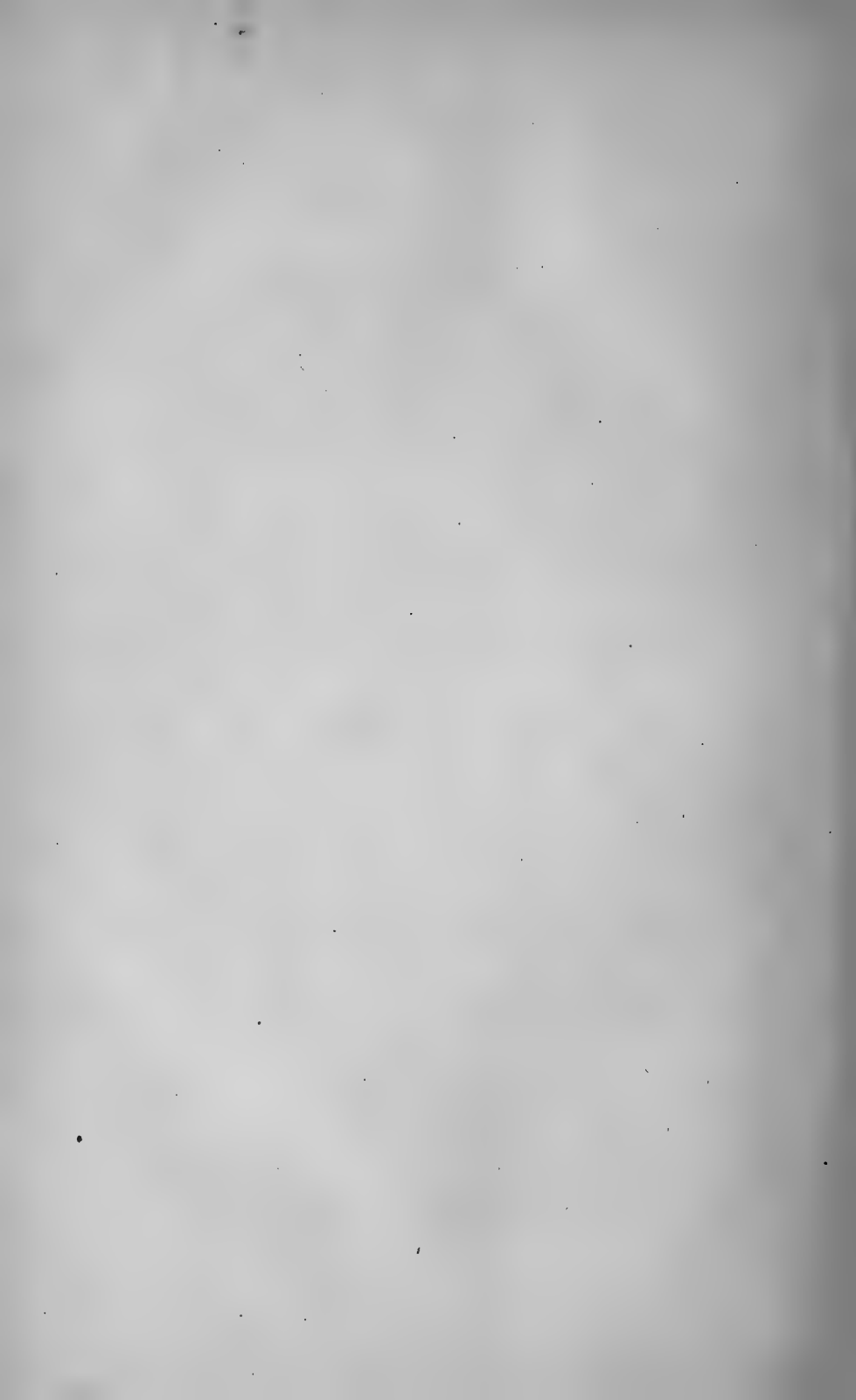
Paludina seminalis, HINDS, Voy. of the Sulphur, p. 54, pl. xvi, f. 22; Arch. f. Nat. 1843, II, 130. (Vide also Annals Nat. Hist. x. 83.)

The above is the original description and a copy of the figure of Hinds (fig. 81). Haldeman (*Leptoxis*, p. 156) refers *Paludina seminalis* to *Pal. Nuttalliana*, Lea, which is placed doubtfully in *Leptoxis*.

Bithynia tentaculata, LIN.—This early known shell is thin, semitransparent, quite smooth, shining, and of a fulvous horn color; in shape it ranges from ovate-acute to oblong-acute, but the latter form is by far the less frequent. It is composed of 5 volutions, of which the body whir, when viewed dorsally, is equal to the rest collectively, and whilst they are only moderately convex (and sometimes only slightly so), is generally more or less ventricose. The more produced is the shell, the less convex are the turns. The suture is distinct but fine, and the whirls, instead of jutting out abruptly, as in *Leachii*, shelve gently downwards. The general proportion of their breadth to their height is as two to one. The apex is very small, and rather pointed; the enlargement of the succeeding volution is sudden. There is no true umbilical cavity, but at most a slight crevice behind the pillar lip, which latter is narrow, somewhat appressed, and not dilated anteriorly. The aperture is subpyriformly ovate or obovate, being contracted to a point at its posterior extremity. It occupies 3-7ths of the entire length of the shell, and not half of the greatest breadth. The outer lip is somewhat disposed to expand, and is slightly thickened within by a white ridge, which forms a support for the operculum. Our largest specimen measures a third of an inch in breadth, and rather more than half an inch in length. (*Forbes & Hanley*.)

The above is the description given of this species in England by Forbes and Hanley, Brit. Moll. III, p. 14. It is quoted from Greenland by Möller, &c. I have seen no specimen, but the description given will cause it to be recognized if found. Fig. 79, page 46, represents the animal.

Bithynia castanea, MÖLL.—This species is also referred to Greenland. I have seen no specimen of it.





FAMILY VALVATIDAE.

[Lingual membrane with teeth in seven series (3, 1, 3); the central teeth broad, with a hooked and denticulated apex, the lateral lanceolate, hooked and denticulated. Rostrum produced; tentacles cylindrical; the eyes sessile at their external bases. Mantle simple in front; gill plumose, exposed, the lamina pinnate, spirally twisted, protected by a long, slender respiratory lobe. Foot bilobed in front. Operculum horny, orbicular, spiral, many whirled; whirls with a thin elevated edge. Shell spiral, turbate or discoidal, covered with an epidermis; aperture with the peritreme entire.

Fig. 82.

Operculum of
V. tricarinata,
greatly magni-
fied.

The species of this family are distributed throughout the temperate regions of the globe, living in slow running rivers, ditches, and lakes.—*H. & A. Ad.*]

I have copied Haldeman's figure of *Valvata sincera* to illustrate the animal of this family (fig. 83).

VALVATA, O. F. MÜLL.

Fig. 83.



*Valvata sin-
cera*, greatly
magnified.

[Shell turbate or discoidal, umbilicated, thin, whirls round, simple or keeled, covered with a horny epidermis; aperture circular, peristome continuous.

The species of this small genus inhabit the ponds and ditches of Europe and North America. When the animal progresses, the delicate, retractile, branched plume is projected over the neck. The female deposits her eggs in a single, coriaceous, spherical capsule, which is affixed to stones or the stems of aquatic plants.—*H. & A. Ad.*]

Valvata tricarinata, SAY.—Shell with three volutions; three revolving, carinate, prominent lines, giving to the whirls a quadrate instead of a cylindric appearance. Suture canaliculate, in consequence of the whirls revolving below the second carina and leaving an interval. Spire convex, apex obtuse. Umbilicus large. Carinæ placed, one on the upper edge of the whirl, one on the lower edge, and the third on the base beneath. Breadth one-fifth of an inch.

Inhabits the river Delaware. Rare. Found by Mr. Le Sueur, whose proposed name is here adopted. (*Say*.)

Cyclostoma tricarinata, SAY, J. Acad. N. S. Phil. I, 13, 1817; Nich. Ency. ed. 3; BINNEY's ed. p. 68, 59, 56.

Valvata tricarinata, SAY, Journ. Acad. II, 173; BINNEY's ed. 68.—DESHAYES in Lam. VIII, 507; Tr. El. de Conch. pl. lxxii, f. 4-6.—MENKE, Zeit. f. Mal. 1845, p. 121.—HALDEMAN, Mon. III, pl. i, f. 1-4.—GOULD, Invert. 225, f. 156.—DEKAY, N. Y. Moll. p. 118, pl. vi, f. 130.

Valvata carinata, SOWERBY, Gen. Shells, xli, f. 2.

Valvata unicarinata, DEKAY, N. Y. Moll. 118, pl. vi, f. 129.

Valvata bicarinata, LEA? Tr. Am. Phil. Soc. IX, 21; Proc. II, 83; Arch. f. Nat. 1843, II, 129.

Tropidina carinata, CHENU, Man. de Conch. II, 312, fig. 2232.

Troschel (Gebiss der Schnecken, p. 96, pl. vi, f. 14) figures the lingual ribbon of this species.

This is a very variable species, as shown by No. 8981 of the collection. Variety *simplex* is contained in No. 8982; bicarinated forms in 8941. Mr. Say's specimens of

Fig. 84.

Valvata tricarinata are still preserved in the collection of the Philadelphia Academy of Natural Sciences.



Valvata tricarinata.

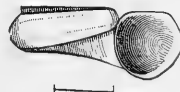
From an examination of them and of Mr. Lea's original *Valvata bicarinata* I am convinced of the identity of the two. I have given (fig. 85) a figure of Mr. Lea's shell and his description below. Haldeman refers it with doubt to *tricarinata*.

I have not seen authentic specimens of the other species mentioned in the synonymy. The original descriptions and fac-similes of the original figures now follow.

Valvata bicarinata, LEA—Shell orbicular, flattened above, bicarinate, rather thick, horn-colored above, whitish below, widely umbilicate; sutures impressed; spire depressed; whirls four, convex; aperture rounded, whitish within.

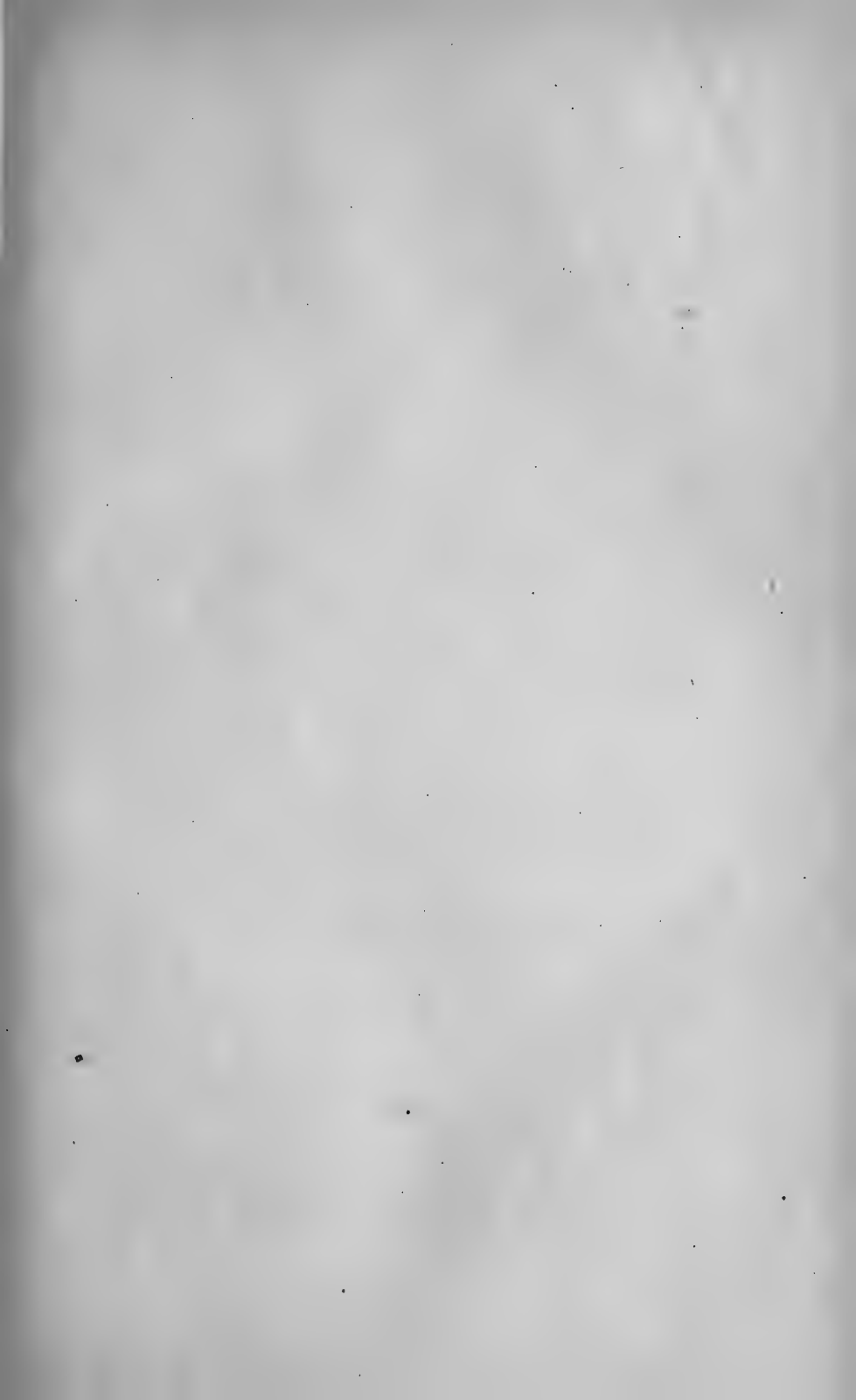
Body rather short and white, head large, tapering, slightly enlarged at the anterior termination, with a black mark passing from the neck between the eyes, tapering off and reaching nearly to the end of the snout, where there are two oblique black marks bordered in front by white, and accompanied behind by several irregular white spots, the anterior ones being the larger. Branchia translucent, superior portion blackish, bordered with white spots and occasionally obtruded; eyes round and deep black, placed at the posterior base of the tentacula, surrounded by a white area; tentacula long, rather tapering, obtuse at the

Fig. 85.



Valvata bicarinata.





end; filament rather short, translucent with longitudinal white lines; foot wide and furcate anteriorly, where minute white spots may be observed. Operculum thin, semitransparent, light horn color, increment circular and rather coarse.

Schuylkill River, west side, below Permanent Bridge. H. C. Lea. My cabinet. Diam. .30, length .12 inch.

In the form of the shell, this species closely resembles the *tricarinata*, Say. It differs in having but two carinæ, in having a wider umbilicus, and the spire is more depressed. The animals of the two species differ in form and color more than the shells.

The head of the *tricarinata* is more cylindrical and enlarged at the termination, where it somewhat resembles the snout of the hog, while that of the *bicarinata* is more conical and without so sudden an enlargement at the end. The color of the *bicarinata* is lighter. In the black markings they also differ. In the *tricarinata* there is a single blotch anterior to the area between the eyes. In the *bicarinata* this extends also behind this area; and in addition may be observed two quite black marks above the mouth, which the *tricarinata* does not seem to have. The tentacula of the *bicarinata* are larger and more filiform. When in motion, the anterior portions of the lobes of the foot are pointed, and recurved or hooked.

The shell of the *bicarinata* is quite light colored beneath, and rather a dark horn color above, the change of color taking place a short distance above the periphery of the whirl, between which and the superior carina it is quite dark. The superior carina is large and erect, the inferior one is smaller. All the whorls are visible beneath. Very minute longitudinal striæ cover the whole surface.

Having several living specimens of both these species, I observed them closely with a lens while under water in a glass vessel. On the 15th of May, while I had a *tricarinata* at the focus of my lens, I observed a small apple green, globose object, passing from under the aperture of the shell. This was shortly followed by others, and soon a transparent gelatinous mass became visible. This mass was passed slowly over the right side of the neck, under the pectiniform movable branchiæ, until entirely discharged against the perpendicular side of the vessel in which it was kept, and there the mass remained attached, the parent having abandoned it immediately. The time was fifteen minutes from the first appearance of the mass until it was fairly discharged. The green globules were the ova, of which I counted thirty in the transparent, globose gelatinous mass, which was not more in diameter than one-twentieth of an inch, the transverse diameter of the shell being about four-twentieths of an inch. In other cases, I found the number of ova to differ; some masses having only ten or twelve.

On the 23d, (eight days after), the ova were so far advanced as to be changed to a dull faded green, the mass enveloping them having changed by degrees in transparency, and becoming of a slightly ferruginous color. As yet, no change of bulk or arrangement was observed.

On the 29th, (fourteen days after), the mass was observed to be opened, and with a lens of considerable power I could plainly see a motion in most of the ova, the rounded form of the shell being easily discerned within.

On the 30th, (fifteen days after), most of the young shells had broken their filmy bonds, only six or seven remaining: their motion was very apparent, and their minute black eyes could be plainly seen. I observed to-day, for the first time, that the *Valvata* has the power of swimming, inverted from the surface of the water, like the *Planorbis*, *Physæ*, &c. Most of the young were in that position, and could move comparatively fast. The action of the mouth in the adult, when swimming in this way, was constant, and changed from an oval to a circular form.

From the above observations, we may conclude that the *Valvata tricarinata* requires from fourteen to fifteen days to be perfected in the ovum, from the time it is ejected and abandoned by its parent. The *bicarinata*, I have no doubt, requires the same time. Numerous globules were deposited about the glass, which globules appeared all to resemble each other, and nearly all the individuals were of the species *bicarinata*. (Lea.)

Fig. 86.

*V. carinata.*

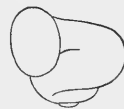
Valvata carinata, SOWB., l. c., is figured only; no description is given (fig. 86).

Valvata unicarinata, DEKAY,—Shell small, apex depressed; whirls 3 or 4, impressed with minute incremental

striae, all flattened above and bounded by a revolving rib or keel, which in the younger individuals ascends to the summit: aperture circular, nearly vertical, scarcely modified by the keel; opercle corneous, thin, with concentric striae; umbilicus wide, profound, exhibiting all the volutions; color milky bluish-white; apex often tinged with rufous. Height .1, diam. .15.

These dimensions are from one of the largest size, obtained from Lake Champlain, where they are very abundant, and from the Erie Canal. It is allied to the preceding (*V. tricarinata*), and forms the passage to *V. sincera*. Some eminent conchologists suppose this, and perhaps the following (*V. sincera*) to be mere varieties of *V. tricarinata*. It approaches the *V. humeralis*, Say, from Mexico; but it is smaller, not so much depressed, and has a wider umbilicus. (DeKay.)

Fig. 87.

*Valvata unicarinata.*

I have evidence of its ranging at least from New England and Pennsylvania to Council Bluff and Methy Lake, lat. 57°.

Haldeman says the ova are deposited from the first day of March to the end of July, in transparent masses half a line in diameter, each containing a number of germs of a bright green color dotted with yellow.

Valvata sincera, SAY—Shell subglobose-conic; whirls nearly four, accurately rounded, finely and regularly wrinkled across; aperture not interrupted by the penultimate whirl, nor appressed to it, but merely in contact with it, the labrum not diminished in thickness at the point of contact; umbilicus large, exhibiting the volutions. Breadth less than 1.5 inch. Inhabits Northwest Territory.

Fig. 88.

*V. sincera.*

For this species I am indebted to Dr. Bigsby. It is very similar to the *tricarinata*, Nobis, but it is destitute of carinated lines and the umbilicus is rather larger; it differs from the *obtusa* of Europe also, in the much greater magnitude of the umbilicus. (Say.)

Valvata sincera, SAY, Long's EX. 264, pl. xv, f. 11; BINNEY'S ed. p. 130, pl. lxxiv, f. 11.—HALDEMAN, Mon. p. 6, pl. i, f. 5-10.—ADAMS, Sh. of Vt. in Thoms. Vt. p. 152.—DEKAY, N. Y. Moll. 119, pl. vi, f. 127, 128.

Valvata depressa, pars, KÜSTER in Chemn. ed. 2, p. 88 (1852).

Valvata striata, LEWIS, Pr. Phil. Ac. N. Sc. 1856, p. 260.

The outline figure published by Say and copied in my figure 88 is not very satisfactory, nor have I ever seen specimens referred to this species which can easily be distinguished from ecarinate forms of *V. tricarinata*. Fig. 83 is a view of the animal copied from Haldeman.

I give also a figure of a specimen of *V. striata* furnished by Dr. Lewis. I have no doubt of its identity with *V. sincera*. Dr. Lewis' description is as follows:—

Fig. 89.

*V. striata.*

Valvata striata.—Shell conical, depressed, umbilicate; aperture round; epidermis brown and very regularly striate. Has all the other features of *sincera* except color and translucency. Animal not observed. Very rarely seen. Of several hundred specimens of *Valvata* only seven were this species. (Lewis.)

No. 8936 of the collection was labelled *V. sincera* by Dr. R. E. Griffith.

Valvata pupoidea, GOULD—Shell small, elongate-ovate, opaque, chestnut-colored, when divested of the rough, dirty pigment which usually adheres closely to it; whirls four or five, minutely wrinkled, the posterior one small and flattened so as to form an obtuse apex; the others cylindrical, and so partially in contact as to expose about one-half of the cylinder; the last entirely disjoined from the preceding one for at least the half of a revolution; aperture circular, lip simple and sharp; on looking at the shell from below, no umbilical opening is found; operculum horny, apex central, elements concentric. Length .1, breadth 3-40 inch.

Fig. 90.

*Valvata pupoidea.*

Found at Fresh Pond and other ponds, on stones and submerged sticks ; and has been for many years in our cabinets marked as a *Paludina*.

Animal very active ; head proboscidiiform, half as long as the tentacles, bilobed in front, dark, terminated with light ; tentacles rather stout, light drab-colored, with a line of silvery dots on the upper side, over the large, black eyes ; foot, tongue-shaped, as long as the first whirl, dilated into two acute angles in front, light drab-color ; respiratory organ occasionally protruded to half the length of a tentacle on the right side.

This species is widely distinguished from all other described ones by its minuteness, its color, its elongated form, and its want of an umbilicus ; of which characters the last two seem to arise from the loose manner in which the whorls are united. (*Gould.*)

Valvata pupoidea, GOULD, Am. Journ. Sc. o. s. XXXVIII, p. 19, 1840 ;
Invert. of Mass. p. 226, f. 155.—HALDEMAN, Mon. p. 10, pl. i, fig. 11-13.—DEKAY, N. Y. Moll. 119.—CHENU, Man. de Conch. II, 311, fig. 2230.

Fig. 90 is an enlarged view of one of Dr. Gould's figures. Found also in Connecticut.

Valvata humeralis, SAY—Shell subglobose, depressed ; spire convex, not prominent ; whorls three and a half, with the shoulder depressed, plane ; wrinkled across, or rather with slightly raised lines ; aperture appressed to the penultimate whirl, but not interrupted by it ; umbilicus rather large. Greatest breadth, less than one-fifth of an inch.

Inhabits Mexico.

Differs from *V. sincera*, nob. of the Northwest Territory, in being more depressed, and in having a shoulder or plain surface near the suture. The umbilicus is larger than that of the *V. piscinalis*, Mull., and the spire more depressed ; that species is also destitute of the depressed shoulder.

Valvata humeralis, SAY ; New Harm. Diss. II, 244 ; Descr. 22. BINNEY'S ed. p. 148.—HALDEMAN, Mon. p. 9.

SPURIOUS SPECIES.

Valvata arenifera, LEA, Tr. Am. Phil. Soc. IV, 104, pl. xv, f. 36 ; Obs. p. 114. On p. 37 of Vol. V it is said to be the larva case of *Phrygania*.

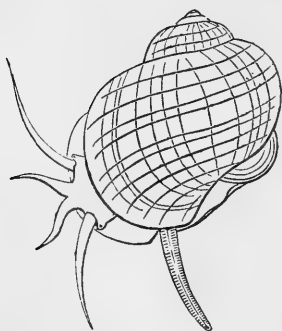
Valvata cinerea, SAY, from Western States, is mentioned by name only by Wheatley in his Cat. of Shells of U. S., p. 29 ; also—

Valvata buccata, LEA, Schuyllkill.

FAMILY AMPULLARIIDAE.

[Lingual membrane with seven series of teeth (3, 1, 3), central teeth acute, lateral, subulate. Rostrum divided into two long tentacular lobes in front; tentacles long and filiform; eyes on peduncles at the outer bases of the tentacles.

Fig. 91.

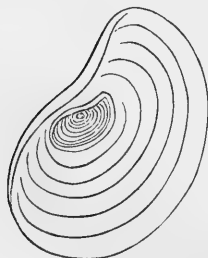


Animal of *A. depressa*, reduced
one-half.

Mantle with a more or less elongated siphon on the left side in front; left gill rudimentary; mantle cavity with a large pulmonary sac on each side. Rectum not traversing the heart. Foot simple. Operculum annular, regular. Shell spiral, turbinate, covered with an olivaceous epidermis; aperture simple in front.

The *Ampullariidæ* are fluvatile, and represent in the ponds and rivers of the tropics the *Viviparidæ* of more temperate climates. Although distinct gills exist, the respiratory cavity is very large and partly closed, so as to enable these animals to live a long time out of water; in fact, they appear to be truly amphibious, and to be enabled to survive a long drought, and have been known to revive after having been kept several years out of water. The long siphonal tube appears to be formed by the left neck-lappet, which is seen in the *Viviparidæ* in a rudimentary state.—*H. & A. Ad.*]

Fig. 92.



Operculum of *A. depressa*.

AMPULLARIA, LAM.

[Siphon elongate. Operculum horny, dextral. Shell dextral, globose, widely umbilicated, last whirl very large, ventricose; spire short; aperture entire, oblong, large, expanded, peritreme simple, always thin, sometimes subreflexed. *Pomus*, *H. & A. Ad.*]

Ampullaria depressa, SAY—Shell ventricose, subglobular, obsoletely banded with obscure green; whirls four, slightly wrinkled; body whirl more prominent above, somewhat flattened towards the suture, of a pale olivaceous color, which is almost concealed by numerous unequal, longitudinal and transverse greenish and brownish lines; spire very much depressed; aperture suboval, within somewhat glaucous, on the margin exhibiting the bands distinctly; labrum simple, as much rounded above as below; umbilicus small, nearly closed. Greatest width one inch and nine-twentieths, total length one inch and a half; length of the aperture one and one-fifth of an inch nearly.

Inhabits East Florida.

During an excursion to East Florida, in company with Messrs. Maclure, Ord, and T. Peale, I obtained a single dead and imperfect specimen of this interesting shell. It occurred in a small creek, tributary to St. John's River, and on the plantation of Mr. Fatio. Captain Le Conte of the Topographical Engineers has since presented me with a perfect specimen, with the information that he observed them in very great numbers on the shores of Lake George, a dilatation of St. John's River; that in some places the dead shells were piled up confusedly to a considerable height, and that the *Numenius longirostra* feeds upon the living animal. The spire is still less elevated than that of the *globosa* of Swainson.

Ampullaria depressa.—As the name *depressa* of the Appendix to Long's Exped. p. 264, is preoccupied by Lamarck for a fossil species, it may be changed to *paludosa*. (Say.)

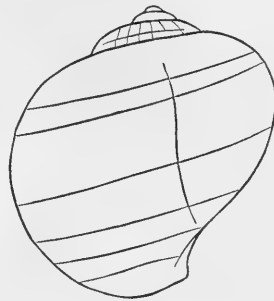
Ampullaria depressa, SAY, Long's Ex. 264, pl. xiv, f. 2; BINNEY's ed. p. 130, pl. lxxiii, f. 2.—HALDEMAN, Mon. p. 5, pl. i, ii.—DE KAY, N. Y. Moll. 124.—HANLEY, Conch. Misc. pl. iii, f. 9.—PHILIPPI, in Chemn. ed. 2, p. 52, pl. xvi, f. 4.

Ampullaria paludosa, SAY, New Harm. Diss. 260; Desc. 22; BINNEY's ed. p. 147.

Ampullaria hopetonensis, LEA, Tr. Am. Phil. S. V, 115, pl. xix, f. 84.—DEKAY, N. Y. Moll. 124.—REEVE, Con. Icon. fig. 60.—PHILIPPI, in Chemn. ed. 2, p. 36, pl. ix, f. 7.

Mr. Say proposed the name *paludosa* because his first name, *depressa*, was preoccupied by Lamarck, An. s. Vert. 1822. Since, however, that *Ampullaria depressa*, Lam. has been removed to the genus *Natica*, I adopt Mr. Say's first name. Figs. 91—92, represent the animal and operculum of this species, copied from Haldeman, the former being reduced in size. Fig. 93 is a fac-

Fig. 93.

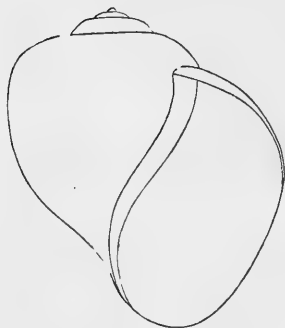


Ampullaria depressa.

simile of the outline of Say's figure, and fig. 94 of Mr. Lea's of *A. hopetonensis*. I have no doubt of the identity of this last named species with *depressa* after examining the typical specimen. No. 8986 and 8987 were labelled by Mr. Lea as *hopetonensis*. Haldeman also places it in the synonymy. The original description here follows, and an outline of the figure (61).

Ampullaria hopetonensis.—Shell subventricose, smooth, flattened above, umbilicate, yellowish-brown, banded; sutures impressed; whirls 5; aperture subovate, white.

Fig. 94.



Ampullaria hopetonensis.

Habitat Hopeton, near Darien, Ga. Prof. Shepard. My cabinet; cabinet of Prof. Shepard. Diam. 1.4, length 1.7 inch. I owe to the kindness of Prof. Shepard of New Haven this interesting shell. It was procured by him during his late geological investigations in our Southern States, with other shells, descriptions of which will be found in these memoirs. It resembles the *A. fasciata*, Lam., but is less globose, the whirls of our species being somewhat flattened on the side and top. It differs from the *A. depressa*, Say, described in Major Long's Exp. to St. Peter's River (subse-

quently changed to *A. paludosa* in the Disseminator) in being less globose, and in being flatter on the side and superior part of the whirls. (Lea.)

DeKay gives as synonyms *A. penesima*, Say, and *A. disseminata*, Say. The names do not occur in Say's writings.

This genus does not appear to belong to the molluscos fauna of the United States, but rather to that of South America. I have not, therefore, included the Mexican species.

SPURIOUS AND EXTRA-LIMITAL SPECIES.

Ampullaria borealis, VALENCIENNES, in Humboldt and Bonpland, Rec. d'Obs. II, 260, is probably *Lunatia heros*, Say. Ferussac (Bull. Zool. 1835, 2d sect. p. 33), in reviewing Valenciennes' work, refers it to a large marine *Natica* figured by Chemnitz. The description is as follows:—

"Shell ventricose, globose, heavy, thick, smoky white, broadly umbilicated, with longitudinal striæ but no wrinkles.

St. Pierre and Miquelon, near Newfoundland.

This species resembles *Am. Guyanensis*. Its proportions are the same; it is longitudinally striate, but its shell is at least three times

as thick, so that it is quite heavy. It is also distinguished by its very large umbilicus, while *A. guyanensis* has none. The color is yellowish or light reddish on the top of the last whirl; the base is white."—*Valenciennes*.

Ampullaria rotundata, SAY—Shell remarkably globose; length and breadth equal, dark brown, but becoming olivaceous towards the aperture; spire but little elevated; suture moderately impressed; body whirl a little undulated instead of being wrinkled; these undulations being very perceptible to the finger within the shell; aperture within on the margin thickened equally all round, and fulvous, with a slight groove for the reception of the operculum, hardly visible but palpable; within somewhat perlaceous; a little darker on the columella; umbilicus small, narrow; operculum calcareous, deeply and concentrically rugose, so as to appear stratified; nucleus on the side towards the labium submarginal. Length less than one inch and four-fifths; greatest breadth about the same.

For this interesting species we are indebted to Captain Leconte, of the Topographical Engineers, who informed me that he found it in St. John's River, in Florida.

It is most closely allied to the *A. globosa*, Swainson, a native of the rivers of India. But that shell is rather less globose, and does not appear to have the almost regular, but slightly elevated and very numerous undulations so perceptible towards the aperture on the body whirl of this species; which has also a few hardly perceptible, distant, brownish bands, particularly towards the base. It may, however, be only a variety of that species. (*Say*.)

Ampullaria rotundata, SAY, N. Harmony Diss. II, 245; Discr.

22; BINNEY'S ed. p. 147, pl. lxxv.—PHILIPPI, in Chemn. ed. 2, p. 68.

Ampullaria globosa, HALDEMAN, Mon. p. 8.—SWAINSON, Zool. Ill. II, 119.

I do not consider this and *Vivipara elongata* well established American species. If actually found in Florida, they were probably brought from Calcutta, where they both are found.

Ampullaria urceus, MÜLLER (*A. rugosa*, Lam.), is found in Mexico. (Vid. Humboldt & Bonpland, Rec. d'Obs. II, p. 258.) Of its presence in the Mississippi Mr. Say says: The "*Ampullaria urceus*, L. (*rugosa*, Lam.) is stated in the books to inhabit the Mississippi River; but I have never been so fortunate as to find it, or to gain any information relative to it there. Mr. O. Evans did me the favor to make inquiry at various places on that river, and to exhibit, as somewhat similar, a colored plate of the *A. globosa*, Swains., to persons from whom information might be expected, and amongst others to some Indians, who in general are known to be accurate observers; but no one has seen any similar shell in the waters of the Mississippi. I

am therefore much inclined to believe that the species is a native of some of the more southern rivers, probably those of Texas. Any information in relation to it, or specimens of the shell, will be very acceptable." See also HALDEMAN, Mon. p. 11; MONTFORT, Conch. Syst. II, p. 244; LAMARCK, An. s. Vert. &c.

Ampullaria flagellata, SAY, N. H. Diss. II, 260; Descr. 22; BINNEY's ed. p. 147.—HALDEMAN, Mon. p. 10.—PHILIPPI, in Chemn. ed. 2, p. 38, pl. ix, f. 7. Near Vera Cruz (Mexico).

Ampullaria flatilis, REEVE, Con. Icon. pl. vii, fig. 31 (1856). Tobasco, Mexico.

Ampullaria cerasum, HANLEY, Conch. Misc. Mexico.

Ampullaria miltocheilus, REEVE, Con. Icon. fig. 120. Chiapa, Mexico.

Ampullaria Gheisbrechti, REEVE, Con. Icon. fig. 123. Chiapas, Mexico.

Ampullaria fumata, REEVE, Con. Icon. 124. Chiapas, Mexico.

Ampullaria violacea, VALENCIENNES, Rec. d'Obs. II, 260.

Ampullaria reflexa, SWAINSON, Phil. Mag. LXI, 377.

Ampullaria malleata, JONAS, Moll. Beit. I. 22.

Ampullaria paludinoidea, CRIST., and IAN in Chemn. ed. 2, p. 27.

Ampullaria scalaris, d'Orb. Mag. de Zool. 1835, p. 31. (*A. angulata*, JAY, Cat. earlier ed.)

This Catalogue represents the state to which I have brought Dr. Gould's manuscript. Any addenda, corrigenda, or other criticisms are solicited.

W. G. BINNEY, Burlington, N. J., May, 1868.

INVERTEBRATA OF MASSACHUSETTS.

NOTE.—The species to whose names a star is affixed are to be figured in the new edition.

TUNICATA.

Botryllidæ.

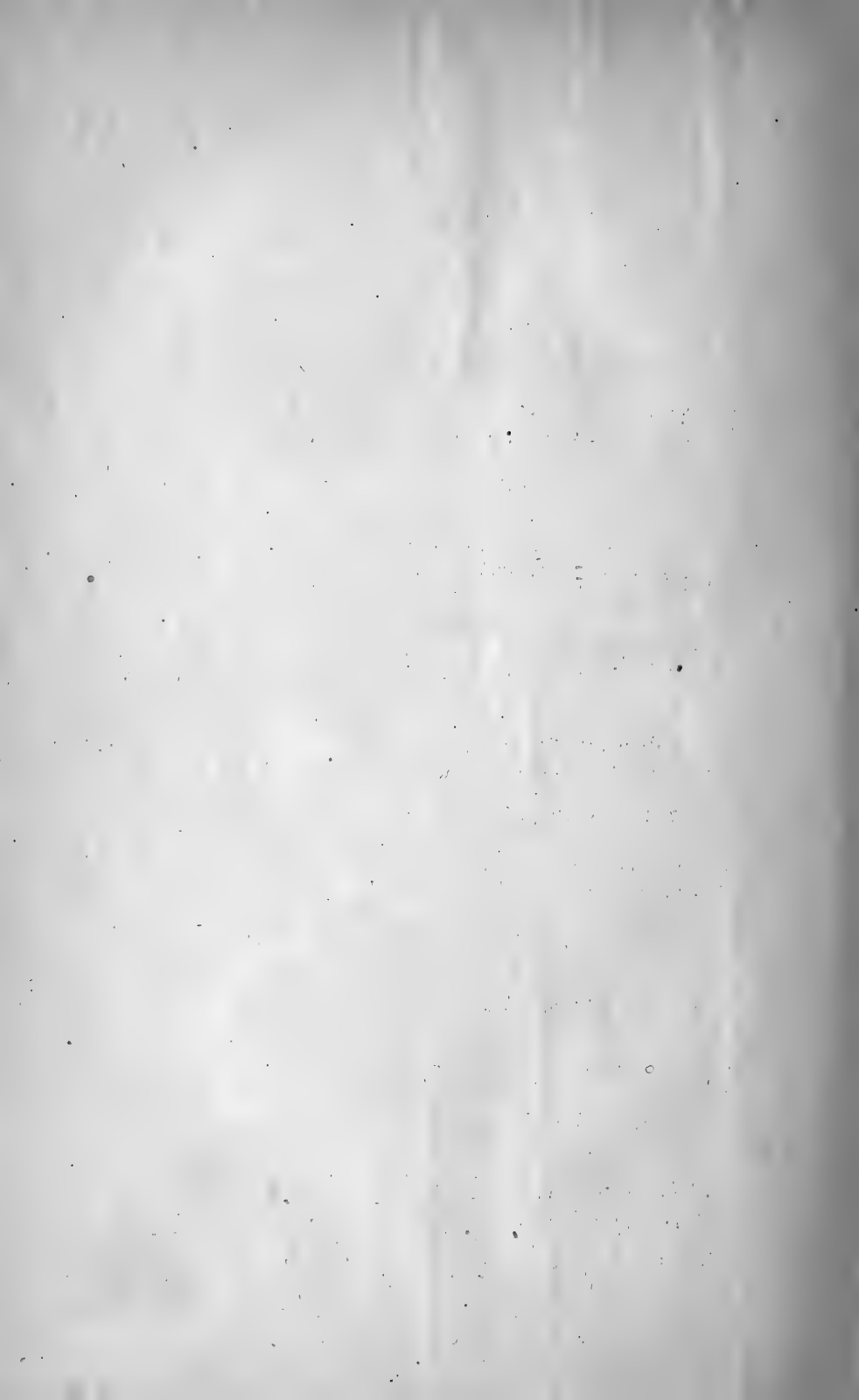
- * Botryllus Schlosseri, *Pallas.*
- * Didemnum roseum, *Sars.*

Salpidæ.

- * Salpa Caboti, *Desor.*

Asciidiidæ.

- * Boltenia clavata, *O. Fabr.*
- * Boltenia microcosmus, *Ag.*
- * Boltenia rubra, *Stm.*
- * Boltenia Burkharti, *Ag.*
- * Pera pellucida, *Stm.*
- * Cynthia pyriformis, *Rathke.*
- * Cynthia partita, *Stm.*
- * Cynthia echinata *Lin.*
- * Cynthia gutta, *Stm.*
- * Cynthia placenta, *Packard.*
- * Cynthia condylomata, *Packard.*
- * Cynthia rugosa, *Ag.*
- * Cynthia hirsuta, *Ag.*
- * Glandula mollis, *Stm.*
- * Glandula fibrosa, *Stm.*
- * Molgula arenata, *Stm.*
- * Molgula producta, *Stm.*
- * Ascidia amphora, *Ag.*
- * Ascidia psammophora, *Ag.*
- * Ascidia ocellata, *Ag.*
- * Ascidia carnea, *Ag.*
- * Ascidia manhattensis, *DeKay.*
- * Ascidia tenella, *Stm.*
- * Ascidia callosa, *Stm.*
- * Chelyosoma geometrica, *Stm.*
- * Pelonaia arenifera, *Stm.*



CONCHIFERA.**Pholadidæ.**

- * *Teredo navalis* *Lin.*
- * *Teredo Norvagica*, *Spagl.*
- * *Teredo Thompsonii*, *Tryon.*
- * *Teredo megotara*, *Hanley.*
- * *Teredo dilatata*, *Stm.*
- * *Teredo (Lyrodus) chloriticus*, *Gld.*
- * *Xylotrya palmulata*, *Lam.*
- * *Xylotrya* ——— ?
- * *Pholas costata*, *Lin.*
- * *Pholas truncata*, *Say.*
- * *Pholas (Zirfea) crispata*, *Lin.*

Solenidæ.

- * *Solen ensis*, *Lin.*
- * *Solecurtus gibbus*, *Spengl.*
- * *Solecurtus divisus*, *Spengl.*
- Machæra squama*, *Bl.*
- * *Machæra costata*, *Say.*
- * *Solemya velum*, *Say.*
- * *Solemya borealis*, *Totten.*
- Panopæa arctica*, *Lam.*
- * *Glycimeris siliqua*, *Ch.*

Myadæ.

- * *Mya arenaria*, *Lin.*
- * *Mya truncata*, *Lin.*

Corbulidæ.

- Corbula contracta*, *Say.*
- * *Neæra pellucida*, *St.*

Pandoridæ.

- * *Pandora trilineata*, *Say.*

Anatinidæ.

- Lyonsia hyalina*, *Cour.*
- * *Lyonsia arenosa*, *Möll.*
- Anatina papyracea*, *Say.*
- Cochlodesma Leana*, *Cour.*
- * *Thracia Conradi*, *Couth.*
- * *Thracia myopsis*, *Beck.*
- * *Thracia truncata*, *Migh.*

Mastradæ.

- * *Mastra solidissima*, Ch.
- Mastra ovalis*, Gld.
- Mastra lateralis*, Say.
- Cumingia tellinoides*, Conr.
- * *Ceronia arctata*, Conr.
- Ceronia deaurata*, Turt.

Kelliadæ.

- Kellia planulata*, Stm.
- * *Kellia suborbicularis*, Mont.
- * *Turtonia minuta*, O. Fabr.
- * *Montacuta elevata*, Stm.

Gastrochaenidæ.

- * *Saxicava rugosa*, Penn.
- * *Saxicava arctica*, Lin.
- * *Petricola pholadiformis*, Lam.
- Petricola dactylus*, Say not Sby.

Tellinidæ.

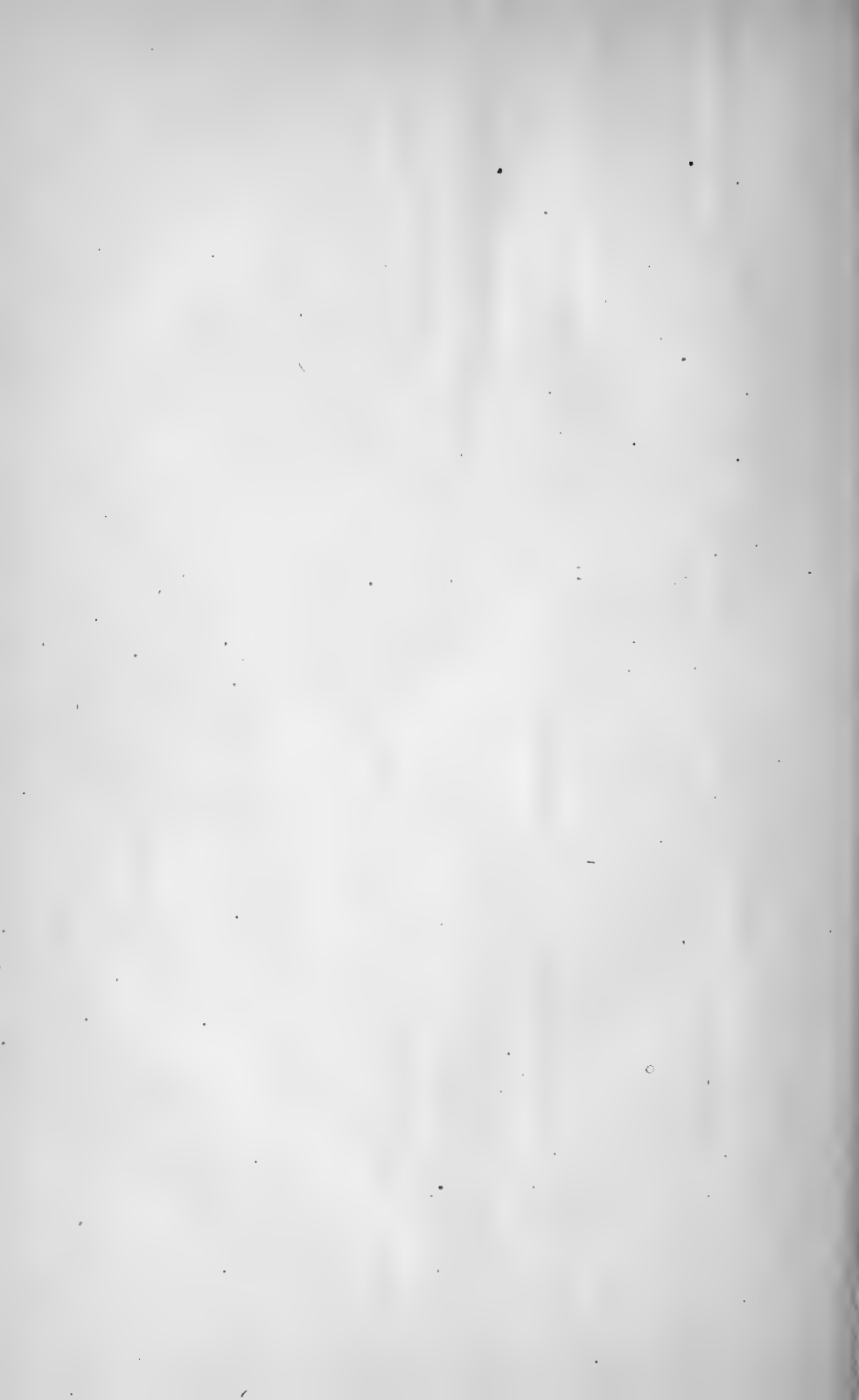
- Macoma fusca*, Say.
- * *Macoma proxima*, Gray.
- Tellina tenta*, Say.
- Tellina tenera*, Say.

Lucinidæ.

- * *Lucina filosa*, St.
- * *Lucina dentata*, Wood.
- Cryptodon Gouldii*, Ph.

Cycladidæ.

- Sphærium simile*, Say.
- Sphærium partumeium*, Say.
- Sphærium rhomboideum*, Say.
- * *Sphærium Vermontanum*, Prime.
- * *Sphærium truncatum*, Linsley.
- * *Sphærium tenue*, Prime.
- * *Sphærium securis*, Prime.
- * *Sphærium occidentale*, Prime.
- Pisidium dubium*, Say.
- * *Pisidium Adamsii*, Prime.
- * *Pisidium compressum*, Prime.
- * *Pisidium equilaterum*, Prime.
- * *Pisidium ferrugineum*, Prime.
- * *Pisidium abditum*, Hald.
- * *Pisidium variabile*, Prime.
- * *Pisidium ventricosum*, Prime.





Cyprinidæ.

- Astarte castanea*, Say.
Astarte sulcata, Mont.
Astarte semisulcata, Leach.
Astarte quadrans, Gld.
* *Astarte elliptica*, Hapl.
* *Astarte Banksii*, Leach.
* *Astarte crebricostata*, Forb.
* *Astarte Portlandica*, Migh.
* *Gouldia mactracea*, Linsley.
* *Cyprina Islandica*, Lam.

Veneridæ.

- Cytherea convexa*, Say.
Venus mercenaria, Lin.
Venus notata, Say.
Tapes fluctuosa, Gld.
Gemma gemma, Totten.
* *Gemma Manhattensis*, Prime.

Cardiadæ.

- Cardium Islandicum*, Lam.
* *Cardium elegantulum*, Beck.
Cardium pinnulatum, Conr.
* *Liocardium Mortoni*, Conr.
* *Aphrodite Grœnlandicum*, Chemn.
Cardita borealis, Conr.

Arcadæ.

- Arca pexata*, Say.
* *Arca transversa*, Say.
Nucula tenuis, Mont.
Nucula proxima, Say.
* *Nucula expansa*, Reeve.
* *Nucula inflata*, Hanc.
* *Nucula delphinodonta*, Mighels.
Yoldia limatula, Say.
* *Yoldia obesa*, St.
* *Yoldia siliqua*, Reeve.
Yoldia thraciæformis, Storer.
Yoldia sapotilla, Gld.
* *Yoldia myalis*, Couth.
* *Leda tenuisulcata*, Couth.
Leda Jacksonii, Gld.
* *Leda minuta*, Mont.
* *Leda caudata*, Lovén.

Unionidæ.

- Unio complanatus**, *Sol.*
Unio nasutus, *Say.*
Unio radiatus, *Gmel.*
Unio cariosus, *Say.*
Unio ochraceus, *Say.*
Margaritana arcuata, *Barnés.*
Margaritana undulata, *Say.*
Margaritana marginata, *Say.*
Anodon fluviatilis, *Lea.*
Anodon implicata, *Say.*
Anodon undulata, *Say.*

Mytilidæ.

- Mytilus edulis**, *Lin.*
 * **Modiola modiolus**, *Lin.*
Modiola plicatula, *Lam.*
Modiolaria nigra, *Gray.*
Modiolaria discors, *Lin.*
Modiolaria corrugata, *Stm.*
Crenella glandula, *Tott.*
Crenella pectinula, *Gld.*

Pectinidæ.

- Pecten Islandicus**, *Müll.*
Pecten irradians, *Lam.*
 * **Pecten tenuicostatus**, *Migh.*
 * **Pecten fuscus**, *Gld.*

Ostreidæ.

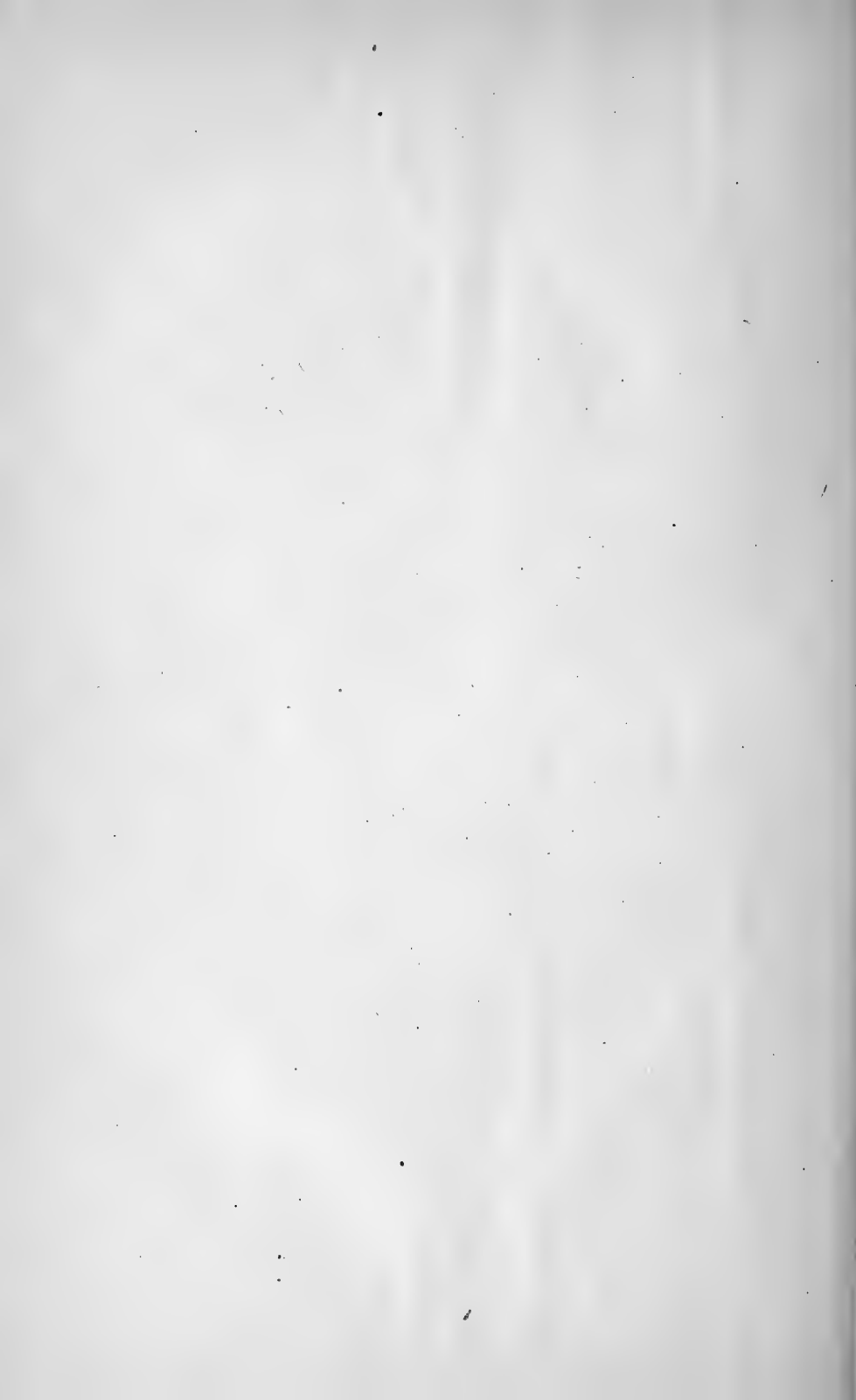
- * **Ostrea Virginiana**, *List.*
 * **Ostrea borealis**, *Lam.*
 * **Anomia ephippium**, *Lin.*
Anomia aculeata, *Gmel.*

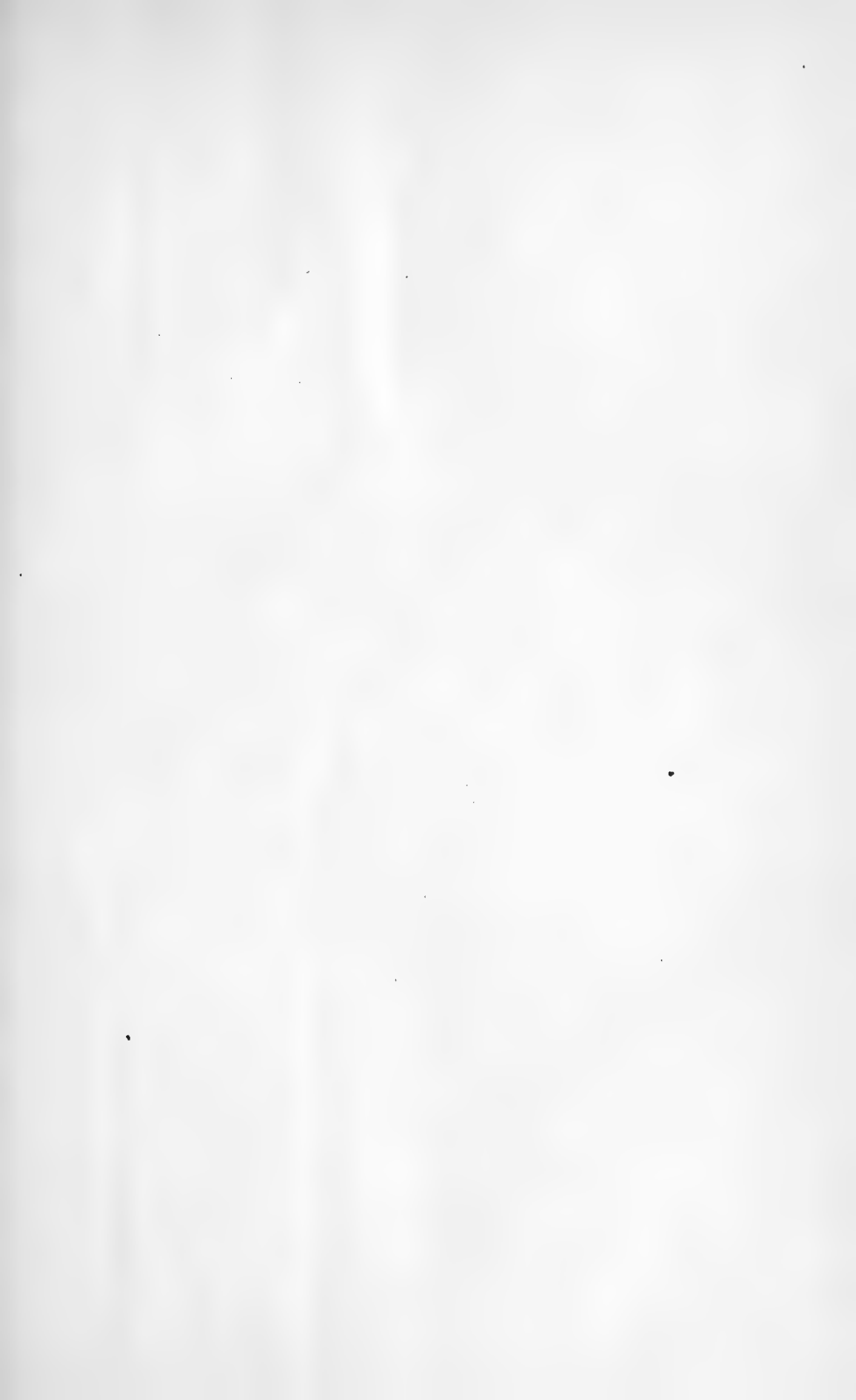
BRACHIOPODA.**Terebratulidæ.**

- * **Terebratulina septentrionalis**, *Coutk.*

Rhynchonellidæ.

- Rhynchonella psittacea**, *Gmel.*
 * **Waldheimia cranium**, *Gmel.*





GASTEROPODA OPISTHOBRANCHIATA.
[NUDIBRANCHIATA.]

Dorididae.

- * *Polycera Lessonii*, *D'Orb.*
- * *Doris bilamellata*, *Lin.*
- * *Doris tenella*, *Ag.*
- * *Doris pallida*, *Ag.*
- * *Doris diademata*, *Ag.*
- * *Doris planulata*, *Stm.*
- * *Doris grisea*, *Stm.*

Triopidae.

- * *Ancula sulphurea*, *Stm.*

Tritoniidae.

- * *Dendronotus arborescens*, *Müll.*

Dotonidae.

- * *Doto coronata*, *Gmel.*

Eolididae.

- * *Eolis papillosa*, *Lin.*
- * *Eolis salmonacea*, *Couth.*
- * *Eolis (Flabellina) Bostoniensis*, *Couth.*
- * *Eolis (Flabellina) rufibranchialis*, *Johnst.*
- * *Eolis (Flabellina) pilata*, *Gld.*
- * *Eolis (Flabellina) stellata*, *Stm.*
- * *Eolis (Flabellina) purpurea*, *Stm.*
- * *Eolis (Cavolina) picta*, *Ald. & Hancock.*
- * *Eolis (Cavolina) diversa*, *Couth.*
- * *Eolis (Tergipes) despecta*, *Johnst.*
- * *Eolis (Tergipes) gymnota*, *Couth.*
- * *Calliopæa fuscata*, *Gld.*
- * *Embletonia fuscata*, *Gld.*
- * *Embletonia fuscata*, var. *lanceolata*, *Gld.*
- * *Embletonia remigata*, *Gld.*

Hermæidae.

- * *Hermæa cruciata*, *Ag.*
- * *Alderia Harvardiensis*, *Ag.*

Elysiidae.

- * *Elysia chlorotica*, *Ag.*
- * *Placobranchus catulus*, *Ag.*

Limapontiidae.

- * *Limapontia zonata*, *Girard.*

[TECTIBRANCHIATA.]

Bullidæ.

- * *Philine sinuata*, *Stm.*
- * *Philine quadrata*, *Wood.*
Philine lineolata, *Couth.*
- * *Scaphander puncto-striata*, *M.*
Diaphana hiemalis, *Couth.*
Diaphana debilis, *Gld.*
Utriculus Gouldii, *Couth.*
- * *Utriculus pertenuis*, *Migh.*
Utriculus canaliculatus, *Say.*
- * *Cylichna alba*, *Brown.*
Cylichna oryza, *Tott.*
- * *Bulla incincta*, *Migh.*
- * *Bulla occulta*, *Migh.*
Bulla solitaria, *Say.*
- Tornatella puncto-striata*, *C. B. Ad.*

GASTEROPODA PROSOBRANCHIATA.**Chitonidæ.**

- Chiton mendicarius*, *Migh.*
- Chiton apiculatus*, *Say.*
- Chiton cinereus*, *Lowe.*
- Chiton ruber*, *Lowe.*
- * *Chiton marmoreus*, *O. Fabr.*
Chiton albus, *Lin.*
- Amicula Emersonii*, *Couth.*

Dentaliidæ.

- Dentalium dentale*, *Lin.*
- * *Entalis striolata*, *Stm.*

Patellidæ.

- Tectura testudinalis*, *Müll.*
- Tectura alveus*, *Conr.*
- * *Lepeta caeca*, *Müll.*

THEORY

Let $f(x)$ be a function of x which is continuous on the interval $[a, b]$.

Then the function $F(x)$ defined by

$$F(x) = \int_a^x f(t) dt$$

is continuous on the interval $[a, b]$.

PROOF.

Let x_0 be any point in the interval $[a, b]$. We shall show that $F(x)$ is continuous at x_0 . Let $\epsilon > 0$ be given. We shall find a $\delta > 0$ such that if $|x - x_0| < \delta$, then $|F(x) - F(x_0)| < \epsilon$.

Let x be any point in the interval $[a, b]$ such that $|x - x_0| < \delta$.

Then

$$|F(x) - F(x_0)| = \left| \int_a^x f(t) dt - \int_a^{x_0} f(t) dt \right| = \left| \int_{x_0}^x f(t) dt \right|$$

Since $f(t)$ is continuous on the interval $[a, b]$, it is bounded on the interval $[a, b]$. Let M be a number such that $|f(t)| \leq M$ for all t in the interval $[a, b]$.

Calyptræidæ.

Crepidula unguiformis, Lam.

Crepidula fornicata, Lin.

Crepidula glauca, Say.

Crepidula convexa, Say.

* *Crucibulum striatum*, Say.

Fissurellidæ.

Cemoria noachina, Lin.

Janthinidæ.

* *Janthina fragilis*, Brug.

Trochidæ. ;

* *Adeorbis costulata*, Möll.

* *Margarita minutissima*, Migh.

Margarita undulata, Sowb.

* *Margarita helicina*, O. Fabr.

Margarita argentata, Gld.

Margarita obscura, Couth.

* *Margarita acuminata*, Migh.

* *Margarita varicosa*, Migh.

* *Margarita cinerea*, Couth.

* *Trochus occidentalis*, Migh.

Paludinidæ.

Valvata tricarinata, Say.

Valvata pupoidea, Gld.

* *Melantho decisa*, Say.

* *Melantho integra*, Say.

* *Amnicola pallida*, Hald.

Amnicola limosa, Say.

* *Amnicola granum*, Say.

* *Pomatiopsis lapidaria*, Say.

Littorinidæ.

Skenea planorbis, O. Fabr.

* *Rissoella ? eburnea*, Stm.

* *Rissoella ? sulcosa*, Migh.

- * *Rissoa minuta*, Tott.
- * *Rissoa latior*, Migh.
- * *Rissoa aculeus*, Gld.
- * *Rissoa multilineata*, Stm.
- * *Rissoa Mighelsii*, Stm.
Rissoa exarata, Stm.
- * *Rissoa carinata*, Migh.
- * *Lacuna vincta*, Mont.
Lacuna neritoidea, Gld.
- * *Littorina litorea*, Lin.
Littorina palliata, Say.
Littorina rudis, Mont.
- * *Littorina tenebrosa*, Mont.
- * *Littorina irrorata*, Say.

Scalariidæ.

- * *Scalaria lineata*, Say.
- * *Scalaria multistriata*, Say.
- * *Scalaria novangliae*, Couth.
Scalaria groenlandica, Perry.

Turritellidæ.

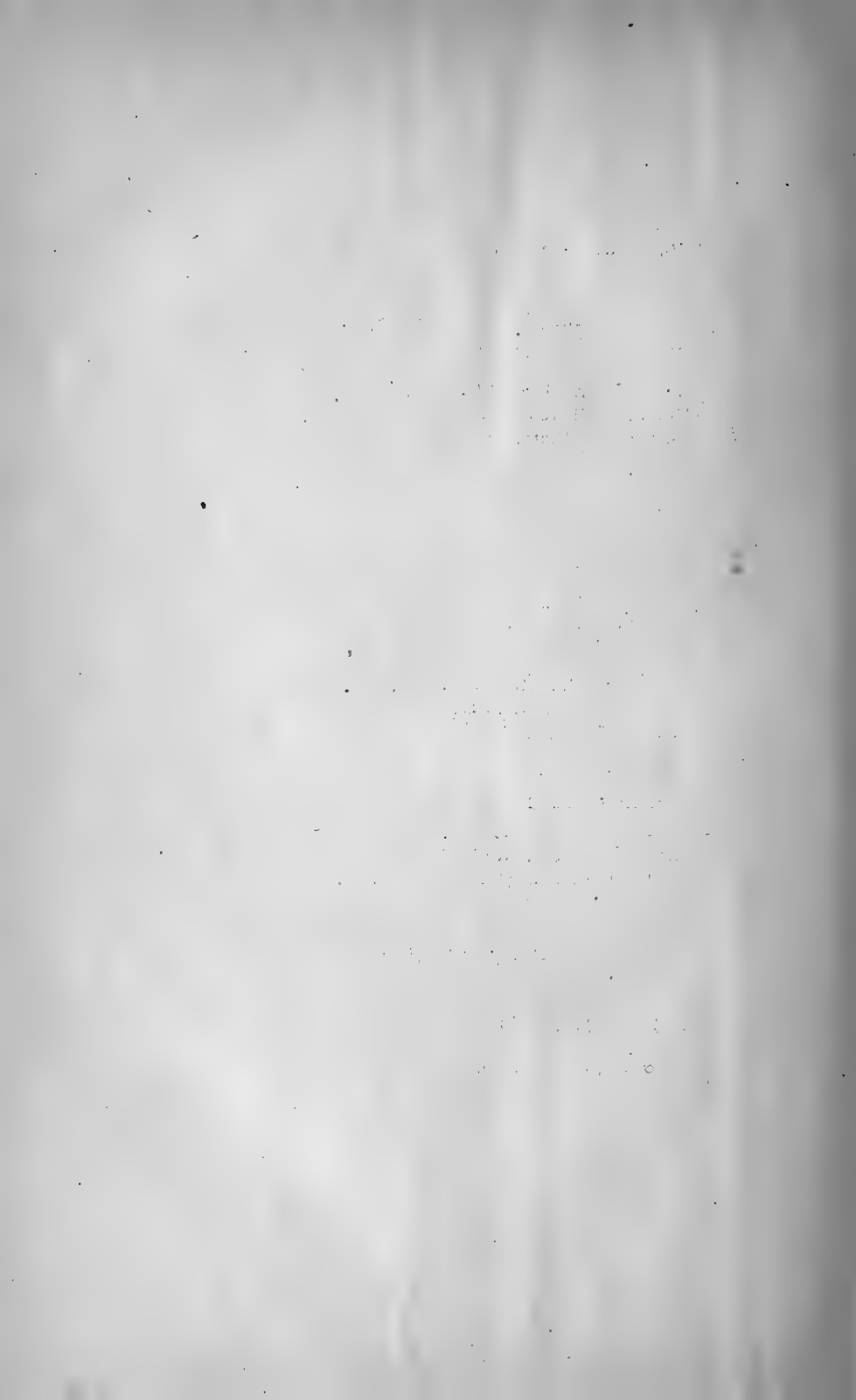
- * *Caecum pulchellum*, Stm.
- * *Vermetus radícula*, Stm.
- * *Turritella erosa*, Couth.
- * *Turritella reticulata*, Migh.
- * *Turritella costulata*, Migh.
- * *Turritella acicula*, Stm.

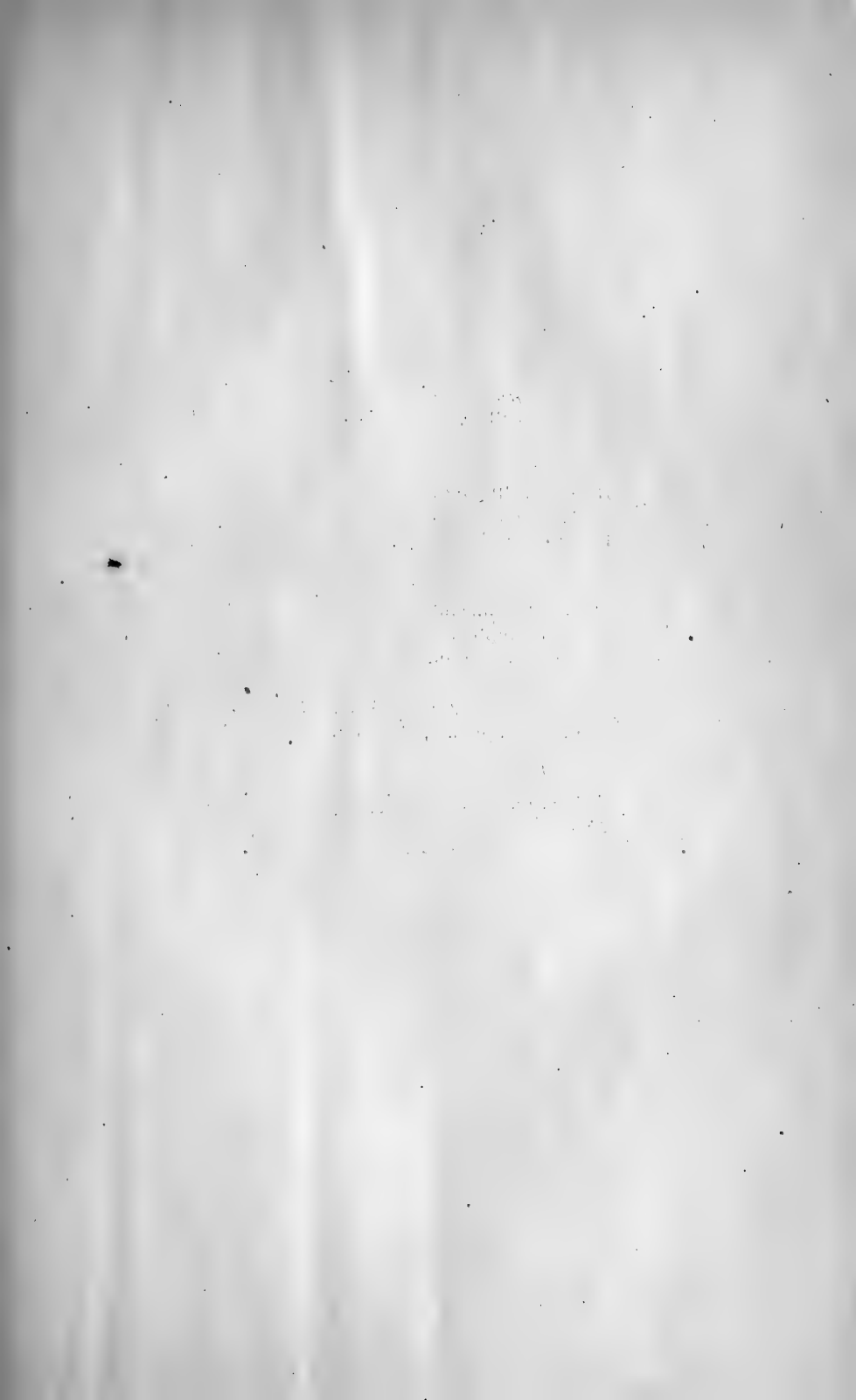
Cerithiidæ.

- Aporrhais occidentalis*, Beck.
- Bittium nigrum*, Tott.
- Bittium Greenii*, C. B. Ad.
- Triforis nigrocinctus*, C. B. Ad.

Pyramidellidæ.

- Odostomia producta*, C. B. Ad.
- Odostomia fusca*, C. B. Ad.
- * *Odostomia dealbata*, Stm.
- * *Odostomia modesta*, Stm.
- Odostomia bisuturalis*, Say.





Odostomia trifida, Tott.

Odostomia seminuda, C. B. Ad.

* *Odostomia impressa*, Say.

Turbonilla interrupta, Tott.

* *Turbonilla nivea*, Stm.

* *Eulima oleacea*, Stm.

Menestho albula, Möll.

Velutinidæ.

Velutina zonata, Gld.

Velutina haliotoides, Müll.

Lamellaria perspicua, Lin.

Naticidæ.

* *Natica pusilla*, Say.

Natica clausa, Sow.

Lunatia heros, Say.

Lunatia triseriata, Say.

Lunatia groenlandica, Möll.

Mamma? *immaculata*, Tott.

Neverita duplicata, Say.

Bulbus flavus, Gld.

Amauropsis helicoides, Johnst.

Turritidæ.

Pleurotoma plicata, C. B. Ad.

Pleurotoma bicarinata, Couth.

Bela turricula, Mont.

Bela harpularia, Couth.

* *Bela violacea*, Migh.

Bela decussata, Couth.

* *Bela cancellata*, Migh.

Bela pleurotomaria, Couth.

Columbellidæ.

Columbella avara, Say.

Columbella rosacea, Gld.

Columbella lunata, Say.

* *Columbella dissimilis*, Stm.

Purpuridæ.

* *Purpura lapillus*, Lin.

Nassa obsoleta, Say.

Nassa trivittata, Say.

Nassa vibex, Say.

* *Buccinum undatum*, Lin.

Buccinum ciliatum, O. Fabr.

Buccinum Donovanii, Gray.

Buccinum ? *cinereum*, Say.

Muricidæ.

Fusus pygmaeus, Gld.

* *Fusus islandicus*, Chemn.

Fusus ventricosus, Gray.

Fusus tornatus, Gld.

Fusus decemcostatus, Say.

Trophon craticulatus, O. Fab.

Trophon clathratus, Lin.

Trophon scalariformis, Gld.

* *Trophon muricatus*, Mont.

Busycon canaliculatum, Lin.

* *Busycon carica*, Lin.

* *Fasciolaria ligata*, Migh.

Ranella caudata, Say.

Cerithiopsis terebralis, C. B. A.

Cerithiopsis Emersonii, C. B. A.

Cancellariidæ.

Trichotropis borealis, B. & S.

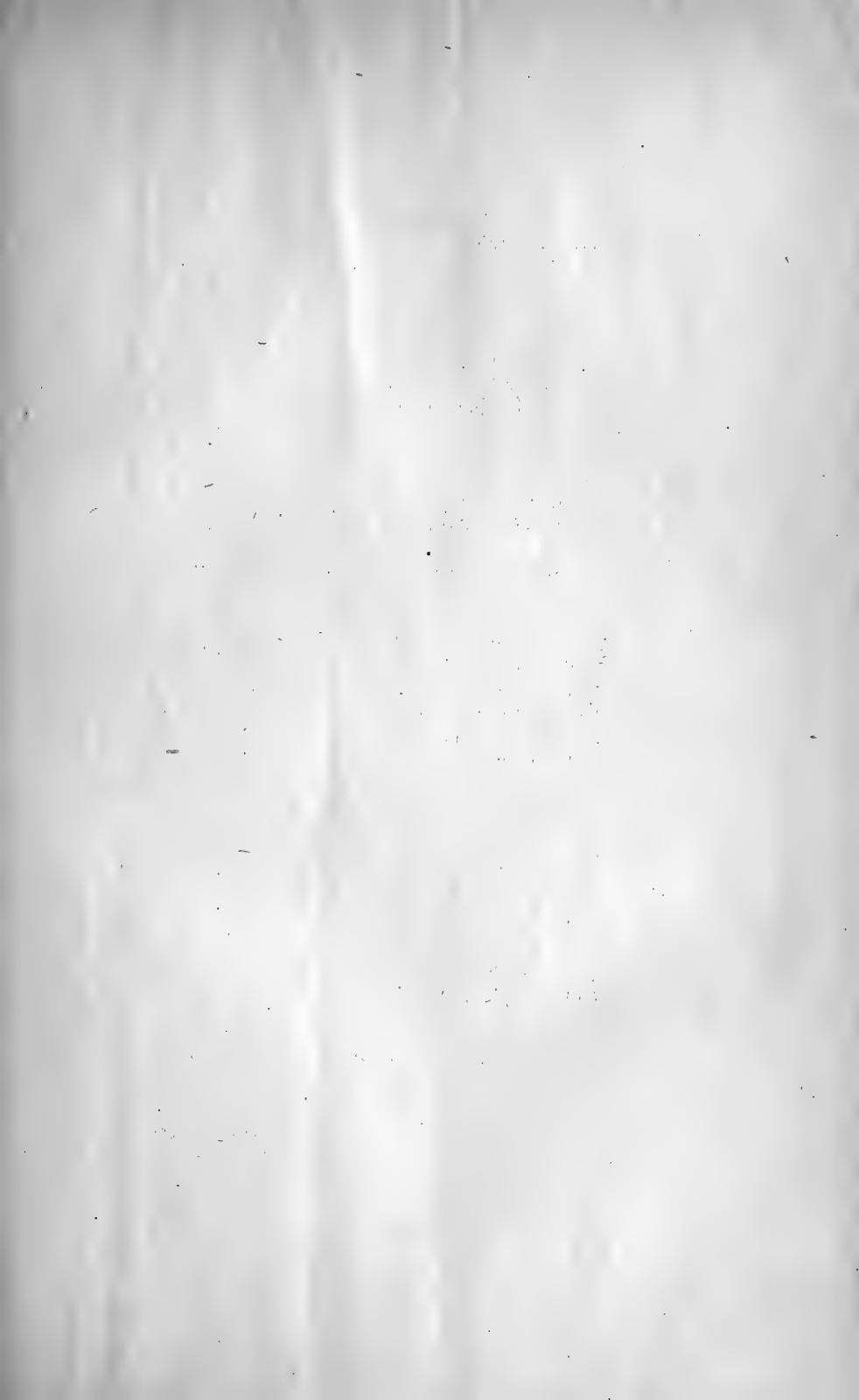
Admete viridula, O. Fabr.

1. The first of these is the

2. The second of these is the

3. The third of these is the

4. The fourth of these is the



GASTEROPODA PULMONIFERA.**Helicidae.**

- * *Vitrina limpida*, *Gld.*
Hyalina cellaria, *Müll.*
Hyalina arborea, *Say.*
Hyalina electrina, *Gld.*
Hyalina indentata, *Say.*
- * *Hyalina minuscula*, *Binn.*
- * *Hyalina milium*, *Morse.*
- * *Hyalina exigua*, *Stimpson.*
- * *Hyalina Binneyana*, *Morse.*
- * *Hyalina ferrea*, *Morse.*
- * *Hyalina chersina*, *Say.*
- * *Hyalina minutissima*, *Lea.*
- * *Hyalina multidentata*, *Binn.*
Hyalina lineata, *Say.*
- * *Macrocyclus concava*, *Say.*
- * *Limax agrestis*, *Lin.*
- * *Limax campestris*, *Binn.*
- * *Limax flavus*, *Lin.*
Helix alternata, *Say.*
Helix striatella, *Anth.*
- * *Helix asteriscus*, *Morse.*
Helix labyrinthica, *Say.*
Helix hirsuta, *Say.*
Helix monodon, *Rack.*
Helix palliata, *Say.*
Helix tridentata, *Say.*
Helix albolabris, *Say.*
- * *Helix dentifera*, *Binn.*
Helix thyroides, *Say.*
- * *Helix Sayii*, *Binn.*
- * *Helix harpa*, *Say.*
Helix pulchella, *Müll.*
- * *Helix hispida*, *Lin.*
- * *Helix hortensis*, *Müll.*
Cionella subcylindrica, *Müll.*

- * *Pupa muscorum*, *Lin.*
- * *Pupa Hoppii*, *Möll.*
Pupa pentodon, *Say.*
- * *Pupa decora*, *Gould.*
Pupa fallax, *Say.*
- * *Pupa armifera*, *Say.*
Pupa contracta, *Say.*
- * *Pupa rupicola*, *Say.*
- * *Pupa corticaria*, *Say.*
- * *Vertigo Gouldii*, *Binn.*
Vertigo milium, *Gould.*
- * *Vertigo Bollesiana*, *Morse.*
Vertigo ovata, *Say.*
- * *Vertigo ventricosa*, *Morse.*
Vertigo simplex, *Gld.*
Succinea ovalis, *Gld.* not *Say.*
- * *Succinea Verrilli*, *Blond.*
Succinea obliqua, *Say.*
- * *Succinea Totteniana*, *Lea.*
Succinea avara, *Say.*

Arionidæ.

- * *Arion fuscus*, *Müll.*
- * *Zonites inornata*, *Say.*
- * *Zonites fuliginosa*, *Griff.*
- * *Zonites suppressa*, *Say.*

Philomycenidæ.

- * *Tebennophorus Carolinensis*, *Bosc.*
- * *Tebennophorus dorsalis*, *Binn.*

Auriculidæ.

- Melampus bidentatus*, *Say.*
- Alexis myosotis*, *Drap.*
- Carychium exiguum*, *Say.*

Limnæidæ.

- Limnæa columella*, *Say.*
- * *Limnæa decollata*, *Migh.*
- * *Limnæa ampla*, *Migh.*
- * *Limnæa megasoma*, *Say.*
Limnæa elodes, *Say.*
Limnæa desidiosa, *Say.*
- * *Limnæa catascopium*, *Say.*
Limnæa umbilicata, *Ad.*
- * *Limnæa pallida*, *Ad.*
Limnæa humilis, *Say.*



- Physa heterostropha**, *Say*.
Physa ancillaria, *Say*.
Bulinus hypnorum, *Lin*.
Pianorbis trivolvis, *Say*.
Planorbis lentus, *Say*.
Planorbis bicarinatus, *Say*.
Planorbis campanulatus, *Say*.
Planorbis hirsutus, *Gld*.
Planorbis deflectus, *Say*.
Planorbis exacutus, *Say*.
Planorbis parvus, *Say*.
Planorbis dilatatus, *Gld*.
Segmentina armigera, *Say*.
Ancylus fuscus, *Ad*.
Ancylus parallelus, *Hald*.
 * **Ancylus borealis**, *Morse*.
 * **Acroloxus ovalis**, *Morse*.

PTEROPODA.

Cavolinidæ.

- * **Diacria trispinosa**, *Les*.

Cymbuliidæ.

- * **Psyche globulosa**, *Rang*.

Limacinidæ.

- * **Heterofusus balea**, *Möll*.
 * **Heterofusus retroversus**, *Fleming*.

Clionidæ.

- * **Clione limacina**, *Phipps*.

CEPHALOPODA.

Loligopsidæ.

- Loligopsis pavo**, *Les*.

Onychoteuthidæ.

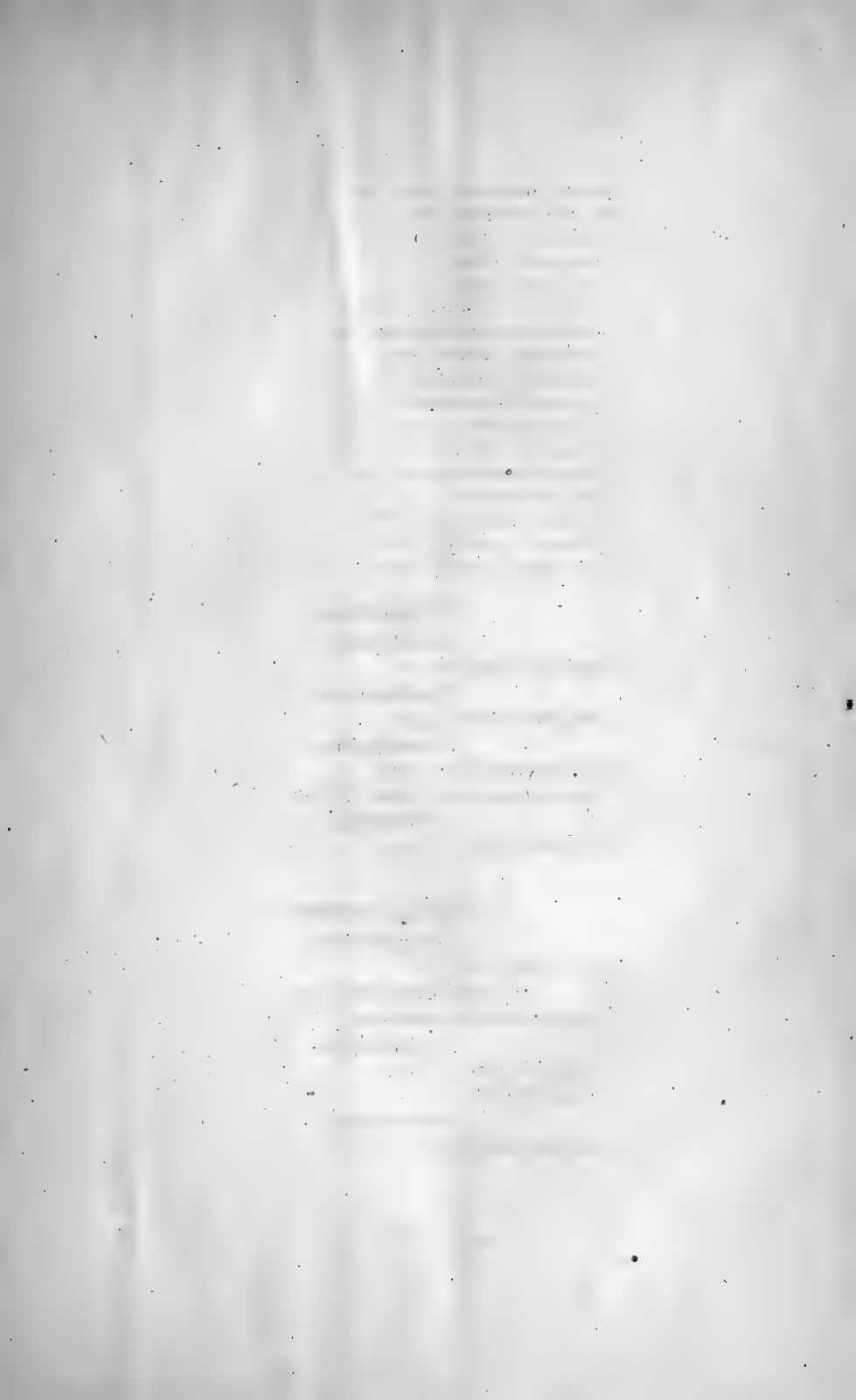
- Ommastrephes sagittatus**, *D'Orb*.

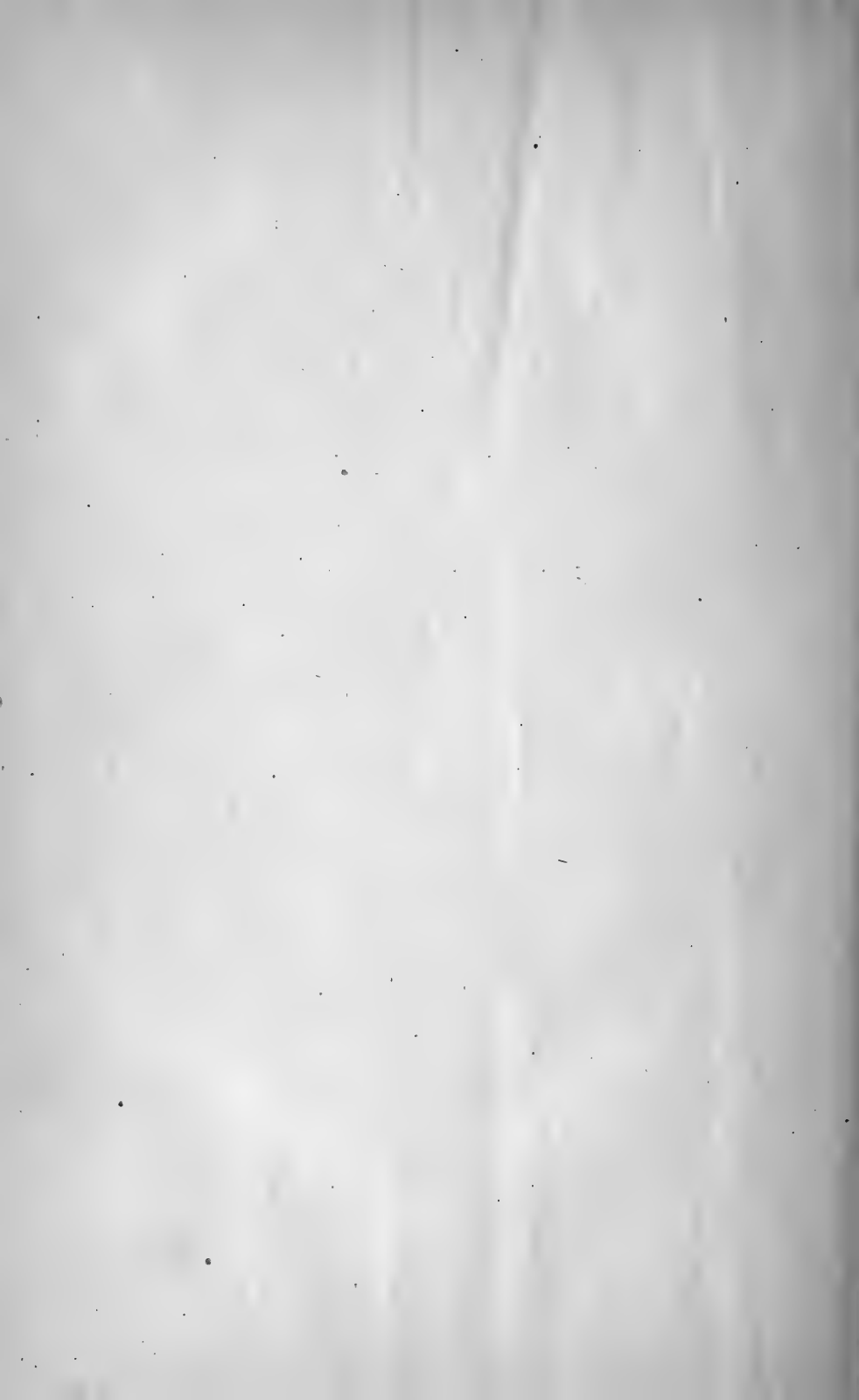
Loliginidæ.

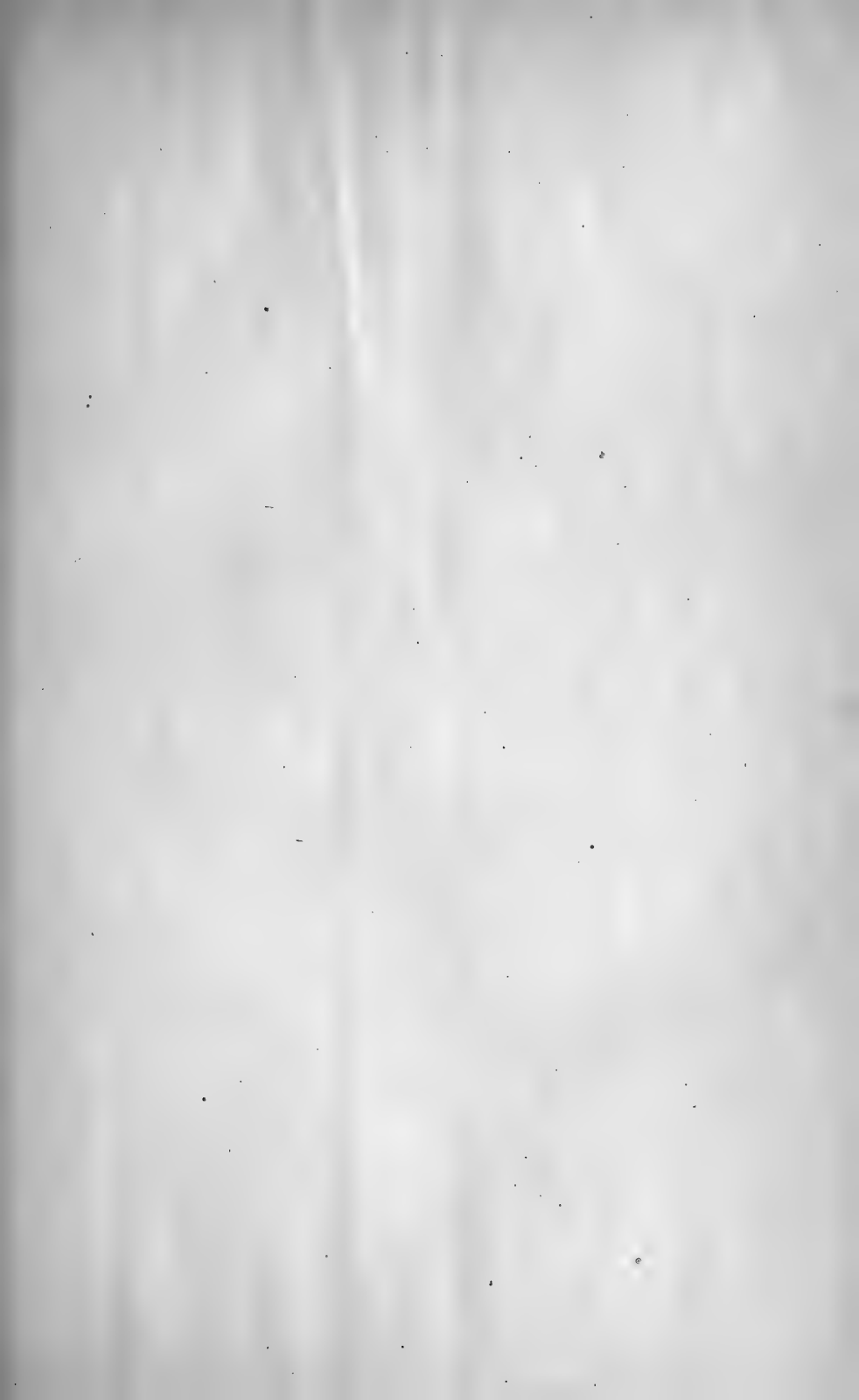
- Loligo punctata**, *DeKay*.
Loligo Pealei, *Les*.

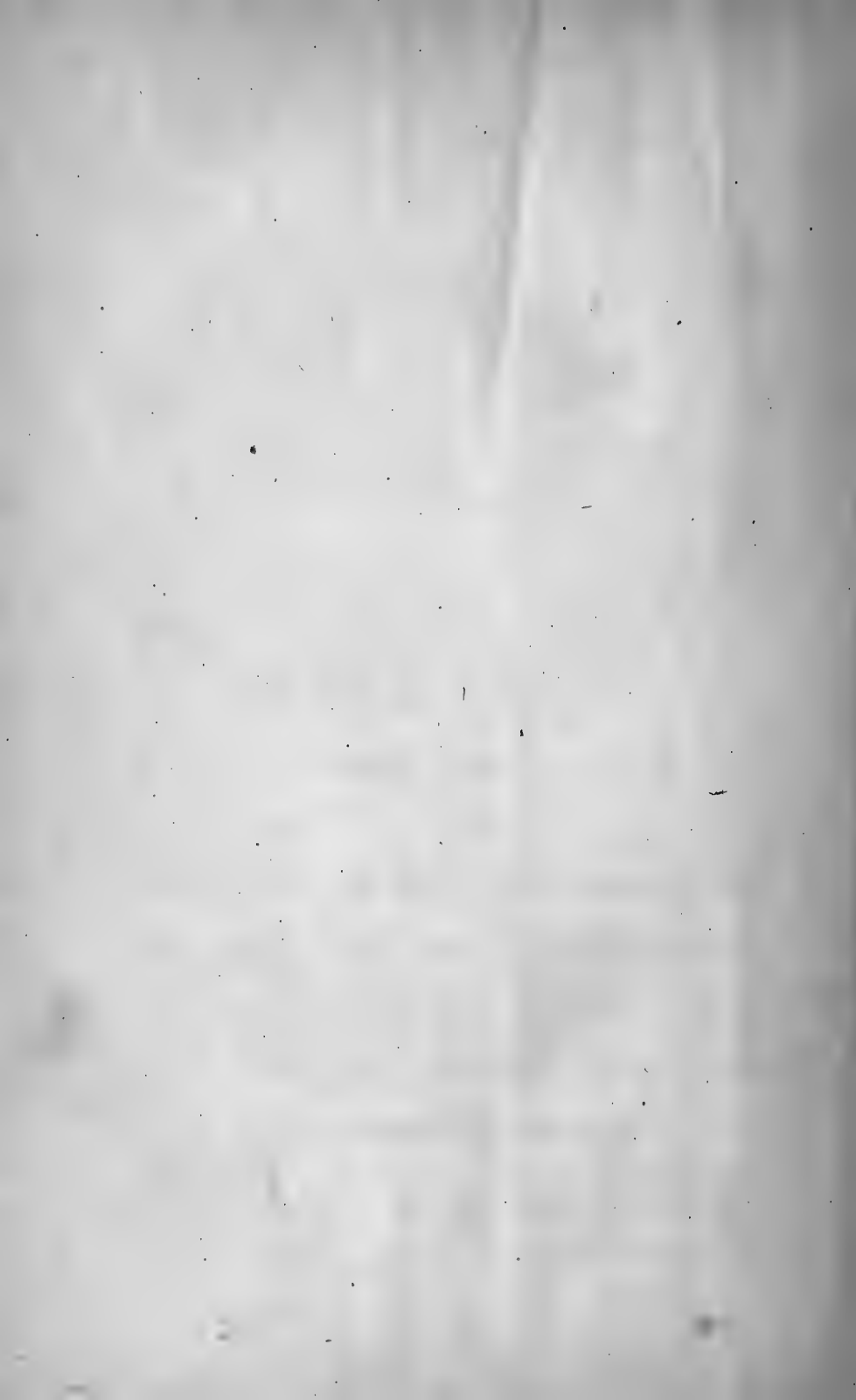
Spirulidæ.

- Spirula fragilis**, *Lam*.









Notes on Lingual Dentition of Mollusca.

BY W. G. BINNEY AND THOMAS BLAND.

No. I.

Reprinted from the Annals of the Lyceum of Natural History, Vol. IX., February, 1870.

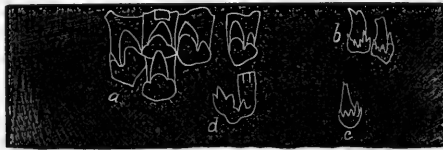
THE illustrations given in this paper are from figures obtained by the use of photographic negatives in a magic lantern, and reduced by photography. The negatives were taken by our friend Mr. Sam. Powel, of Newport, R. I., to whom we are indebted for valuable aid in the study of lingual dentition.

Succinea Nuttalliana, Lea.

The specimen from which was taken the lingual membrane here figured was labelled by Mr. Lea. It was received from the Smithsonian Institution. No locality is given for the specimen,

but it was preserved in the same bottle as *Ancylus Newberryi*, *Pompholyx effusa*, *Fluminicola Nuttalliana*, and other species of the Pacific coast.

FIG. 1. *

Lingual dentition of *Succinea Nuttalliana*, Lea.

Lingual membrane broad. Teeth 19.1.19, in almost straight transverse rows. Centrals short, stout, obtusely tricuspid, the central cusp with a long acute point, attached to a quadrate plate, the upper edge of which has a central quadrangular spot of thinner texture, easily mistaken for a complete cutting away of a portion of the plate. Laterals on somewhat oblong plates which bear on their outer upper corner a small quadrangular expansion, stoutly and obtusely bicuspid, the larger cusp surmounted by a long acute point; base rounded. Uncini on plates with rounded bases and attenuated and serrated apices, irregularly denticulated.

Fig. 1, *a* shows two centrals and two laterals, with a third lateral detached; *b* and *c* show uncini from the left of the median line; *d* the eighth lateral, partly in profile.

The jaw of *Succinea Nuttalliana* has a perfectly smooth anterior surface.

***Bulimulus pallidior*, Sowerby.**

Lingual membrane broad, with numerous nearly straight transverse rows of 40.1.40. teeth. Centrals with one long blunt

FIG. 2.

Lingual dentition of *Bulimulus pallidior*, Sowb.

median, and two obsolete, small side cusps; plate subquadrate, rounded at base, excavated at its upper margin, and with small

square, lateral expansions. Laterals much like centrals in shape, unsymmetrical, the inner side cusp being still more obsolete; base and inner side of plate forming one regular outward curve; upper edge of plate horizontal, with one lateral expansion only at its outer corner. Uncini on long, narrow, low, subquadrate plates, with one long, curving, blunt denticle, and one short blunt denticle at its outer side.

Fig. 2, *a* shows two incomplete rows of centrals and laterals; *b* one of the uncini, near the extreme lateral edge of the membrane.

The jaw has already been described (Land and Fresh-water Shells of North America, Part I., p. 196).

This species is from Lower California.

***Helix tumida*, Pfeiffer.**

The specimen which furnished the lingual membrane here described was received from Messrs. Gloyne and Vendryes, of Kingston, Jamaica, to which Island the species belongs.

H. tumida is placed by v. Martens (Die Heliceen, 2d ed., 145) with several other Jamaica species, and *H. pemphigodes*, Pfr., of Cuba, in the subgenus *Cysticopsis* of Morch.

FIG. 3.



Lingual dentition of *Helix tumida*, Pfr.

Lingual membrane with numerous straight rows of 22.1.22 teeth. Centrals with three stout cusps, the middle one very large, on a subquadrate plate which has square lateral expansions above. Laterals of same form as centrals, but lacking the inner side cusp and inner lateral expansion. Uncini with one large and several smaller blunt cusps, attached to a long, subquadrate plate.

The figure presents one-half of one central, the first lateral, and

several uncini (the fourth, fifth, and twelfth) to show variations in their form; also the thirteenth tooth in profile.

The jaw is long, narrow, slightly arched, blunt at ends, with a slight, broad, median projection. There is a long, narrow, conical projection springing upwards from about the centre of the anterior surface of the jaw, of the same color, material, and consistency as the jaw itself. This is not the muscular attachment which often adheres to the jaw after it has been extracted. Jaw with delicate distant longitudinal striæ.

***Zonites lævigata*, Pfr.**

(See Land and Fresh-water Shells of North America, Part I., p. 287.) The wood-cut here given was engraved from a drawing

FIG. 4.



Lingual dentition of *Zonites lævigata*, Pfr.

by Dr. Leidy, prepared for, but not published in, the "Terrestrial Mollusks of the United States." The drawing was at once recognized on our recently obtaining the lingual membrane of the species.

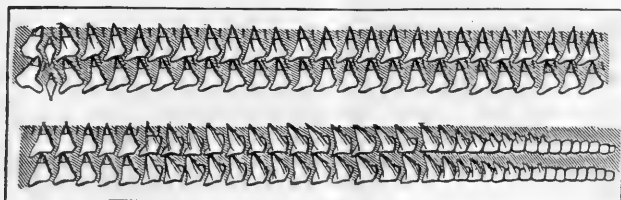
Teeth 17.1.17, arranged in curving transverse rows. Centrals short, stout, rounded at sides, square at base, apex with three short and pointed cusps, the middle one longest. Laterals long, narrow, tricuspid, the outer cusp very short and sharp, the central cusp extremely long, bulging at sides, tapering to an acute point; inner cusp almost as long as central cusp, narrow, pointed; third and fourth laterals merging into the uncini, which are aculeate, as common to the genera *Zonites* and *Hyalina*. The centrals are on a long, narrow plate, whose four sides curve rapidly inwards. The laterals are on plates long, narrow, curving outwards in an arcuate manner.

An extremely instructive lingual, showing the merging of laterals into uncini more completely than in any we have previously examined.

Veronicella Floridana, Binney.

(Terr. Moll. U. S., II., p. 17.) On p. 306 of Land and Fresh-water Shells of North America, Part I., we figured the lingual

FIG. 5.



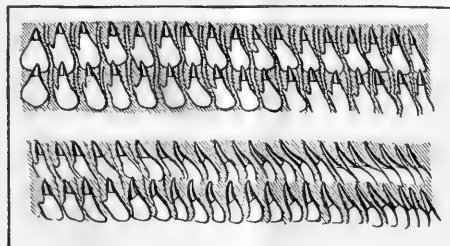
Lingual dentition of *Veronicella Floridana*, Bin.

dentition of this species, as drawn by Mr. Morse. We now give a figure drawn by Dr. Leidy for the "Terrestrial Mollusks of the United States," but not included in that work. The details of the separate teeth are much more accurately shown in the new figure. It will be noticed that Dr. Leidy gives 58.1.58 teeth, Mr. Morse 41.1.41, and our text (p. 304) 48.1.48.

Limax flavus, Linn.

A figure of the lingual dentition of this species, drawn by Dr. Leidy, is also given, for comparison with that of Mr. Morse, on

FIG. 6.



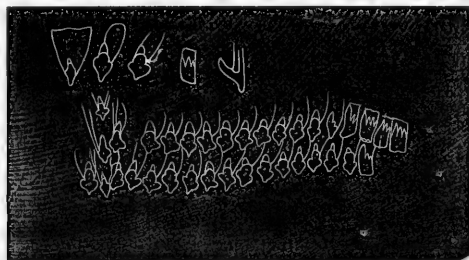
Lingual dentition of *Limax flavus*, L.

p. 63 of Land and Fresh-water Shells, Part I. Here also the number of teeth varies, as in *Veronicella Floridana*, described above.

Melampus bidentatus, Say.

The specimen which furnished the lingual membrane figured was collected at Newport, R. I., by Mr. Sam. Powel.

FIG. 7.

Lingual dentition of *Melampus bidentatus*, Say.

Lingual membrane broad. Teeth 33.1.33. Centrals small, upright, with rounding base and bulging sides, reminding one somewhat of the ace of clubs, its apex elongated, terminating in a distinct, acute denticle; this central is attached to a very large triangular plate, greatly expanded above. Laterals uniform, larger than the centrals, of the same shape, but less symmetrical, and with a much more extended and narrower basal projection; these laterals are perpendicular, but are attached to obliquely curving plates, long and narrow, each plate being detached. There are about thirteen of these laterals, in almost straight horizontal lines, on both sides of the median line. The uncini change abruptly from the laterals, are in oblique rows, are attached to upright, oblong plates, square at top and base, diminishing as they pass off laterally; the uncini are rather square, their broad, simple apices are armed with three strong denticles, the inner denticle being the largest.

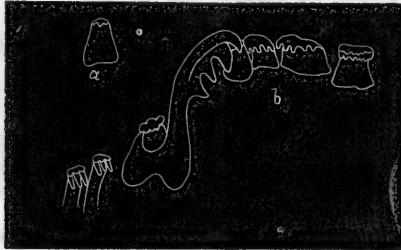
The figure represents two rows of centrals with the laterals to the right of the median line and a few uncini. The upper line of figures gives the central, the first two laterals, one of the uncini, and one of the laterals in profile, all detached.

The teeth of this membrane are so nearly on a plane as to allow one photograph to bring out all the details.

***Helicina occulta*, Say.**

Lingual membrane long and narrow. Teeth 00.5.1.5.00, in transverse, arching rows. Centrals upright, longer than wide, widest at the horizontal base, slightly narrowing towards the apex, which is nearly as wide as the base, broadly recurved and

FIG. 8.

Lingual dentition of *Helicina occulta*, Say.

denticulated at its cutting edge. First lateral oblong, shorter than the central, rounded at base, narrowed towards the apex, which is broadly recurved and denticulated; this lateral is inclined obliquely from the central, its apex being reflexed in the same direction. The second lateral resembles the first lateral in every particular, but is much less wide. Third lateral perpendicular, longer than broad, triangular, its apex small, reflexed and denticulated. Fourth lateral very long, irregular, jaw shaped, its lower edge for one-half its length furnished with four strong, large, acute, beak-like denticles; the left end of this lateral is produced in a horizontal direction, at right angles to the direction of the balance of the tooth, is excavated above and below, and in some instances appeared to have a wing-like expansion behind the uncini. Fifth lateral quite small, subcircular, its apex broadly reflected and denticulated, the whole tooth fitting into the upper excavation of the horizontal portion of the fourth tooth. The uncini, more than twenty-five in number, are long, slender, crowded, the apex reflexed and continued in three fringe-like denticles.

There seems to be great uniformity in the teeth of the different

transverse rows, but there are in some instances five beak-like denticles on the fourth lateral. It is difficult to follow this tooth behind the crowded uncini, but we are confident that in some instances it is very much more expanded than shown in the figure, resembling a gull's wing. The first beak-like denticle seems to be on the same plane as the upper portion of the tooth; the other three are on the same plane as the lower portion; this is shown in the figure by the line running parallel to the upper edge of the tooth. The apex of the first denticle seems often to be recurved.

The fifth lateral is with much difficulty found under the microscope. It is on a different plane from the other teeth, and is crowded into the excavation in the fourth lateral. It seems often wholly filled up with foreign matter, not being as readily cleaned as the other teeth, even in a solution of potash.

The whole lingual is a very difficult study, and requires numerous views to bring out the details of its structure by photography. It is owing only to the untiring perseverance of Mr. Powel that we are able to illustrate it satisfactorily.

Fig. 8, *b*, shows the central and one-half of one transverse row of the laterals, with two uncini only. The balance of the uncini curve rapidly outwards and downwards, giving to the entire transverse section of the lingual membrane the usual strongly arched outline. (See Land and Fresh-water Shells of North America, Part III., fig. 216.)

Fig. 8, *a*, represents the third lateral, which is not well shown in its crowded position, as in *b*.

On p. 108 of Land and Fresh-water Shells of North America, Part III., a fac-simile is given of Troschel's figure of the lingual dentition of the other species of the United States, *Helicina orbiculata*. A comparison of the two figures will show that the species differ in their lingual dentition as widely as in their shells.

The specimen from which the membrane was extracted was found living by Mr. E. R. Leland, who gives the following notes of its station :—

"The locality in which I found the *Helicina occulta* is a fishing station known as Whitefish Bay, six miles north of this city (Milwaukee, Wisconsin), on the slope of the lake bluff, which at that point is somewhat wet and boggy, with a growth of pines, tamaracks, juniper, and some deciduous trees. They were under dead leaves beside logs; on the 30th of May and 6th of June, 1869, they were in considerable numbers, though they could hardly be said to be abundant. I have not visited that place since the latter date. On the 19th inst., however, I found a few specimens in a ravine near the lake, about two miles and a half north of the city—making in all some twenty-five specimens found, among which are two young ones with an acute carina."

The locality is an interesting one, showing the possibility of a tropical genus existing in a cold latitude. The discovery of Mr. Leland is of far greater importance, however, in proving beyond doubt the fact of *Helicina occulta* actually existing at the present time. The species is found very plentifully in a fossil state in the post-pleiocene of the Western States, and is generally supposed to be extinct. Dr. Binney has (Terr. Moll. I., 183, 184) argued at length against this opinion, and figured specimens apparently recent (Ibid. III., pl. lxxiv., fig. 1); he also referred to this species the shell found living in Western Pennsylvania by Dr. Green, and described by him as *Helicina rubella*. Specimens in an apparently recent state have also been received by us from Sheboygan, Wisconsin, and through the Smithsonian Institute from Lexington, Virginia, collected in the latter locality by Mr. McDonald. Fresh specimens were, however, so rare that belief in the extinction of the species prevailed generally. Dr. Gould referred (Terr. Moll. U. S., II., 352) *Helicina rubella* to *Helicina orbiculata*, a recent species found as far north as Tennessee, and finally in the Land and Fresh-water Shells of North America, Part III., *Helicina occulta* is removed from the catalogue of recent species and quoted only among the fossils.

Mr. Leland has now reversed this decision by finding the animal actually living. It is in consequence fair to presume that

the Sheboygan specimens are also recent, as well as those from Lexington, Virginia, and that the species, though, perhaps, rarer than formerly, is still to be found in the Western States.

Those persons not having access to Doughty's Cabinet of Natural History will be interested to know that *Helicina rubella* was found on hills not far from Pittsburg, Pa., on the old post road from that place to Wheeling. Dr. Green received it from a friend, and immediately questioned its origin, but was assured that it had been actually found living on more than one occasion.

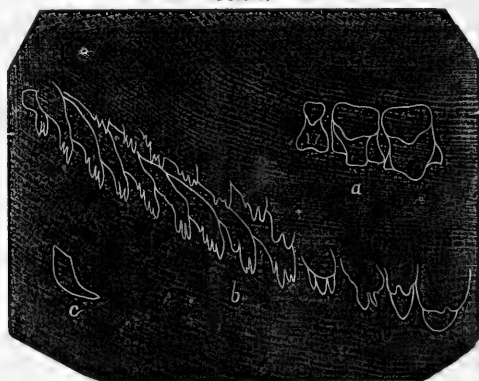
We presume that Prof. Kirtland (Ohio Report) refers to the same individuals as received by Dr. Green, when he speaks of a species of *Helicina* being found on the hills adjacent to the Ohio river.

Mr. Say described *Helicina occulta* from fossil specimens from a bluff near New Harmony, Ind. He did not notice it living, nor has any author done so. The name occurs, indeed, in several catalogues of Recent Species, but we have never known it to be found with the living animal until now.

Pompholyx effusa, Lea.

The shell from which was extracted the lingual membrane

FIG. 9.



Lingual dentition of *Pompholyx effusa*, Lea.

here described is one of the original lot received from California, from which the species was described. It was labelled by Mr. Lea.

A figure of the shell, with descriptions of the external characters of the animal, will be found in Land and Fresh-water Shells of North America, Part II., p. 73-74. As there has been some discussion in regard to this species having two pairs of eyes, we will here repeat that the eyes are situated in the place usual in the *Limnæidæ*.

Lingual membrane broad, with 22.1.22 teeth. Central teeth upright, narrow, widening and knobby at the base; apex recurved, and produced into an obtuse beak. Laterals nine on each side of the central line, in a straight transverse row, wide, quadrate, apex recurved, prolonged beyond the base of the tooth in a more or less broad blunt beak. Uncini about thirteen on each side of the median line, in oblique transverse rows, not attached to a plate, simple and not recurved; the first eight from the extreme lateral edge of the membrane long, narrow, arm-shaped, terminating in a wrist-like contraction and hand-like expansion, strongly digitate. The remaining uncini gradually changing into the shape of the laterals, but still not merging into them, the line of demarcation being strongly marked.

There is great variation in the beak-like projection of the recurved apex of the laterals, and still more in the digitation of the uncini.

The jaw is long, narrow, slightly arcuate, with blunt ends; anterior surface smooth.

By the characters of its lingual dentition, and its horny jaw, *Pompholyx* appears nearly related to *Planorbis*.

Fig. 9, *a*, represents the central and two laterals to the right of the median line; *b* gives one full series of uncini to the left of the median line; and *c* one of the uncini in profile.

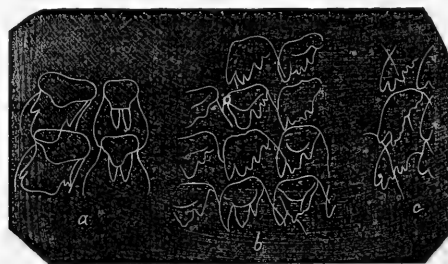
***Planorbis trivolvis*, Say.**

The specimen from which was extracted the lingual membrane here figured was collected at Newport, Rhode Island, by Mr. Sam. Powel.

Lingual membrane broad, with slightly curving rows of teeth.

Teeth 19.1.19. Centrals sub-oval, rounded at base, narrowing toward the top, which is squarely truncated; apex broadly recurved into an obtuse beak, beyond which are two long, narrow, tusk-like projections. First seven laterals uniform, in an almost straight transverse series, detached, inclining obliquely toward the median line, large, square, broadly reflexed, extending beyond the base in a wide, blunt beak, at each side of which are

FIG. 10.

Lingual dentition of *Planorbis trivolvis*, Say.

usually one or more small denticles. These laterals pass gradually into the uncini, which are in curving rows, long, narrow, widely recurved, with variable, strong, beak-like digitations on their apices and outer sides.

There is great variation in the digitations on the uncini, no two of which appear alike. The laterals also vary somewhat in the breadth of their recurved beaks.

Fig. 10, *a*, represents two central teeth with two of the first laterals on the left of the median line; *b* the merging of the laterals into the uncini; and *c* extreme uncini. *b* and *c* are taken from the right of the median line.

***Tulotoma magnifica*, Conrad.**

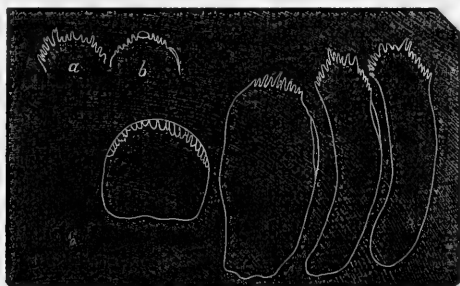
Through the kindness of Dr. E. R. Schowalter, of Uniontown, Alabama, we are able to describe the lingual dentition of *Tulotoma magnifica*, Conrad. The specimens received from Dr. Schowalter were taken in the Coosa river, Alabama.

It will be seen that in its lingual dentition *Tulotoma* is more closely allied to *Vivipara* (as suggested by Gill, Proc. Acad. N.

Sc., Phila., 1863) than to *Melantho* and *Lioplax*. (See Land and Fresh-water Shells of North America, Part III., pp. 16, 35, 55, etc.)

Lingual membrane long, with the arrangement of teeth usual to the family. Teeth 3.1.3. The centrals are subcircular, with a truncated, irregularly horizontal base; the apex recurved, channelled, and obtusely knobbed or denticulated. The first lateral is about as wide as the central, oblong, bulging at the sides, truncated and horizontal at base, its apex deeply digitated or fringed, some of the denticles being recurved at their apices. The second

FIG. 11.

Lingual dentition of *Tulotoma magnifica*, Conrad.

lateral is laminar, narrowing slightly towards the truncated base, curving outward from the central tooth, its apex with long fringe-like denticles, some of which are recurved, others obtusely knobby. The third lateral resembles in shape and size the second, but is somewhat less curved, and has shorter, less delicate denticles.

There is considerable variation in the number, length, delicacy and arrangement of the denticles on the different teeth. In some cases they are very broad, with simple recurved edges. In others they are long, narrow, and bifurcate. Again on many teeth the denticles are not absolutely separated one from the other, but the end of the tooth is rather deeply channelled.

The variations occur in the laterals, the centrals being more uniform. The side edge of the laterals is sometimes recurved for a considerable length.

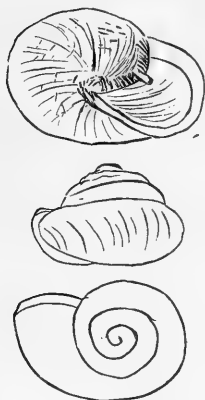
In figure 11 outlines are given of one central tooth and the three laterals of one side of the lingual membrane, with (*a* and *b*) the apices of two separate laterals, to show variation in the denticulations.

The generic characters of the animal of *Tulotoma* never having been given, we add them here. Foot moderate, not produced beyond the snout. Color dark blue. Head and snout small. Lingual teeth as described above. Right tentacle broad. Left cervical lappet small; right larger, trough-shaped. Branchial laminae numerous, long, narrow, crowded in a double row.

Mesodon leucodon of Rafinesque.

The name *Mesodon leucodon*, Raf., has found its way into the books as a synonym of *Helix thyroïdes*. As no description of any

FIG. 12.



such species was ever published by Rafinesque, we have expressed the opinion that it was originally a manuscript name sent by Rafinesque to Ferussac. (Terr. Moll. U. S., IV., 54.) Since that time we have seen a manuscript work by Rafinesque, entitled "Conchologia Ohioensis," given by Prof. Haldeman to the Smithsonian Institution. In this there occurs not only a description, but a figure of *Mesodon leucodon*. These are here copied as conchological curiosities. They have, of course, no scientific value.

Mesodon leucodon thyroïde.

"*Mesodon Leucodon*. Roussâtre, varié de petites taches brunes, irrégulières, provenant de l'animal; très finement strié entravers; levre bordi aigu, réfléchi; dent blanche, oblique au milieu de la bouche; forme bombée, convexe, obtuse; opercule collé, membraneux."

The operculum referred to is no doubt the epiphragm.

In the same manuscript are other figures scarcely recognizable, but one of *Mesodon labiatum*, a species not described in any

printed work, seems to represent the carinated form of *Helix pal-*

FIG. 13.



Mesodon labiatum.

liata. A copy of this figure is here given.

Note on ***Vivipara lineata***, Valenciennes.

BY W. G. BINNEY.

WHEN studying the Viviparidæ of North America in preparing the Smithsonian "Land and Fresh-water Shells of North America, Part III.," I found in use, both in published works and in collections, the name *Paludina lineata* of Valenciennes for a species of *Vivipara* of the United States. From the work of Humboldt and Bonpland I obtained the description of Valenciennes, of which an English translation is here given :—

Paludina lineata.—This species resembles that of the Seine. It is equally ventricose, but has a thinner shell. Shell ventricose-ovate, thin, diaphanous, with delicate transverse striæ; greenish horn-color, with numerous transverse greener vittæ. Whirls five, last one large, ventricose, and equalling in height one-half the entire length of the shell. Besides the striæ of growth, there are numerous transverse, very fine lines. The whirls are not flattened towards the moderate suture. Apex acute. Color green, sometimes somewhat corneous ground, on which are a large number of bands of a deeper green and variable width, sometimes merely linear. On the upper whirls the bands are obsolete. Apex not eroded in any of a large number of individuals.

Operculum brown, thin, horny, covered with numerous concentric, not spiral lines. Found in Lake Erie by M. A. Michaud, who found one shell full of young, as in the case of our species, which proves the species to be viviparous. There is reason to believe the other species also are so, though in the most natural genera species vary in being both oviparous and viviparous. The genera of colubers and vipers among the reptiles are an example of this, while the Mollusca furnish more numerous ones.

Length 1 inch 3 lines.

It needed but a glance at this description to convince me that it was never drawn from a specimen of the species to which the name *lineata* has been applied by American authors. It was equally clear to me that the description was not applicable to any species known to inhabit the region indicated by Valenciennes. I was obliged, therefore, in the work referred to (p. 31), to leave it a doubtful species, with the hope of its eventually being rediscovered.

Here the matter rested, until an opportunity occurred of clearing up all doubt regarding the identity of *Paludina lineata*, Valenciennes. While in Paris, in 1867, it occurred to me to look among the shells at the Garden of Plants for the original specimen of Valenciennes. Through the kindness of Prof. Lacaze-Duthiers every facility for the search was given me. I very soon found the desired type, glued to a card tablet and labelled, in the handwriting of Valenciennes, "*Paludina lineata*, Val., dans Humboldt et Bonpland, tome II. Du lac Erie, l'Amérique du Nord, par M. Michaud;" but below was written in the same hand "C'est faux, elle vient de l'Inde."* Here then was a simple solution of the difficulty. The species is not American. It is the well-known Eastern shell figured by Küster as *Paludina Bengalensis* (Chemn., ed. 2, figs. 15, 16). Other specimens from Delhi, Bengal, &c., are labelled *P. lineata*, also in Valenciennes' handwriting; on one tablet *Pal. fasciata*, Gray, is given as a synonym.

A few days after this interesting discovery at the Garden of Plants I was looking at a copy of Humboldt and Bonpland's "Recueil d'Observations, &c." at the house of M. Crosse. Turning to the description of *Paludina lineata*, I found a marginal note referring the species to Bengal instead of Lake Erie. Recognizing the handwriting of Valenciennes, I called the attention of M. Crosse to it, and learnt that the book had actually belonged to Valenciennes, at the sale of whose library it was bought by M.

* *Paludina lineata*, Val., in Humboldt and Bonpland, vol. 2. From Lake Erie, North America, by Mr. Michaud. This is a mistake, the shell comes from India.

Crosse. Here, then, was an additional proof of the erroneous habitat originally given by Valenciennes.

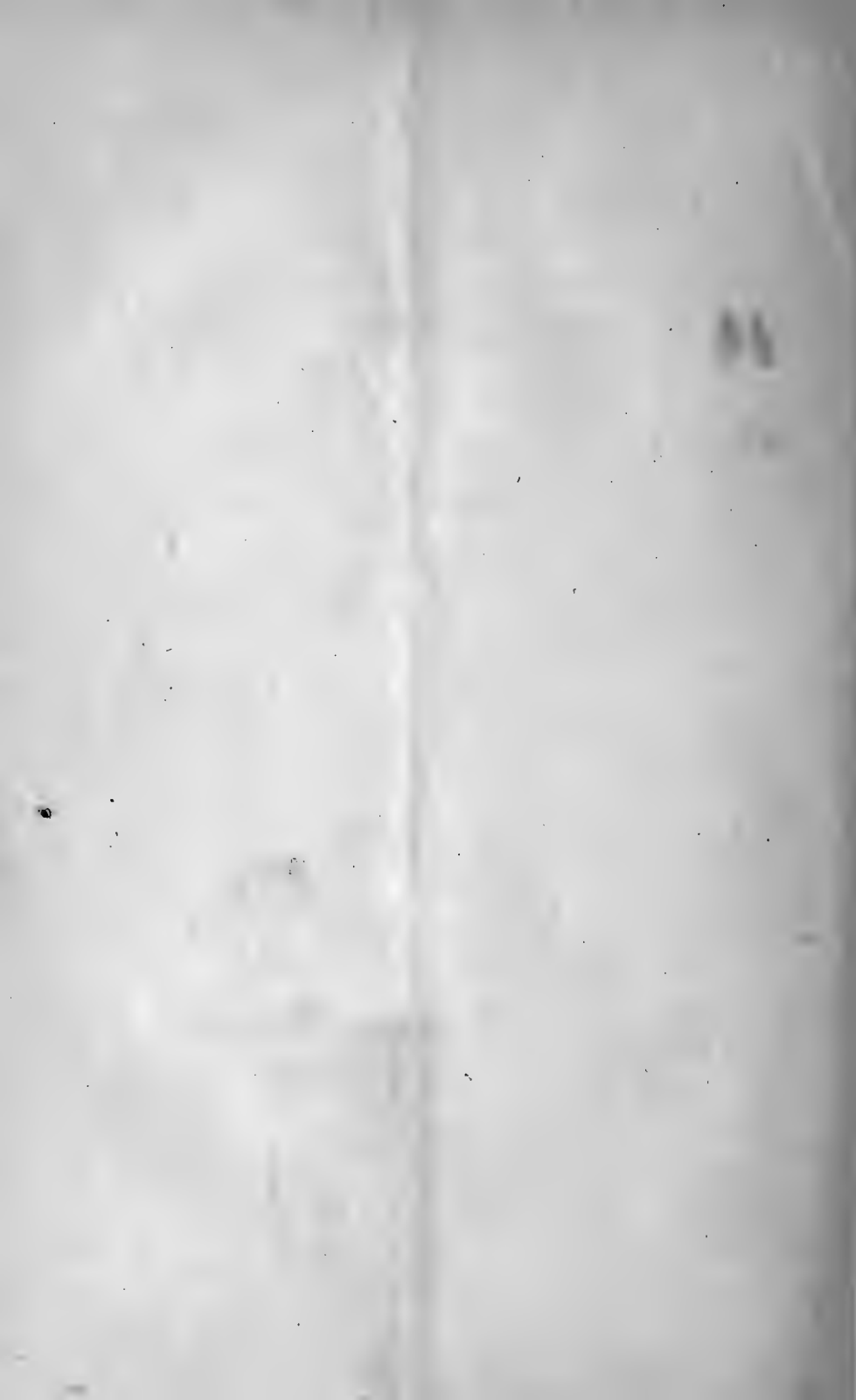
I should add that the shell found by me labelled as the type of *Paludina lineata* in the Garden of Plants answers well to the description of Valenciennes.

The facts given above remove *Paludina lineata* from the catalogue of American *Viviparidæ*. Unfortunately, however, the name *lineata* remains to burden and confuse our synonymy. Haldeman, surely without critical examination, referred Valenciennes' description of *Pal. lineata* to the North American species described by Say as *Paludina vivipara*. Haldeman has been blindly followed by most American authors, and by Küster, who further adds to the confusion by a typographical error, using *linearis* instead of *lineata* in a single instance, a name which some have tried to perpetuate.

This confusion would have been avoided by a reference to the original description of Valenciennes, instead of accepting the name from correspondents or books. It is one of the greatest faults of American writers on Conchology thus to accept names, without reference to original descriptions.* Until this fault is corrected, the disgraceful confusion of our synonymy will be worse confounded.

* An instance of the mistakes thus arising is to be found in reference to this very species of Valenciennes. A writer in the Proc. Ac. Nat. Sc., Phila. (1862), 451, notes the fact of a certain species of North American *Vivipara* being characterized by *four* spiral red bands, and further insists on the permanency (invariability?) of the characteristic as a guide in distinguishing it from an allied European form which has but *three* bands. Yet this author refers this strictly four-banded species to *Paludina lineata*, Valenciennes, a species described not as having *four* red spiral bands, but as having a *large number* of bands of a deeper *green* and variable width, sometimes merely linear. Surely, if the species invariably has four bands, such a description as the last cannot apply to it.







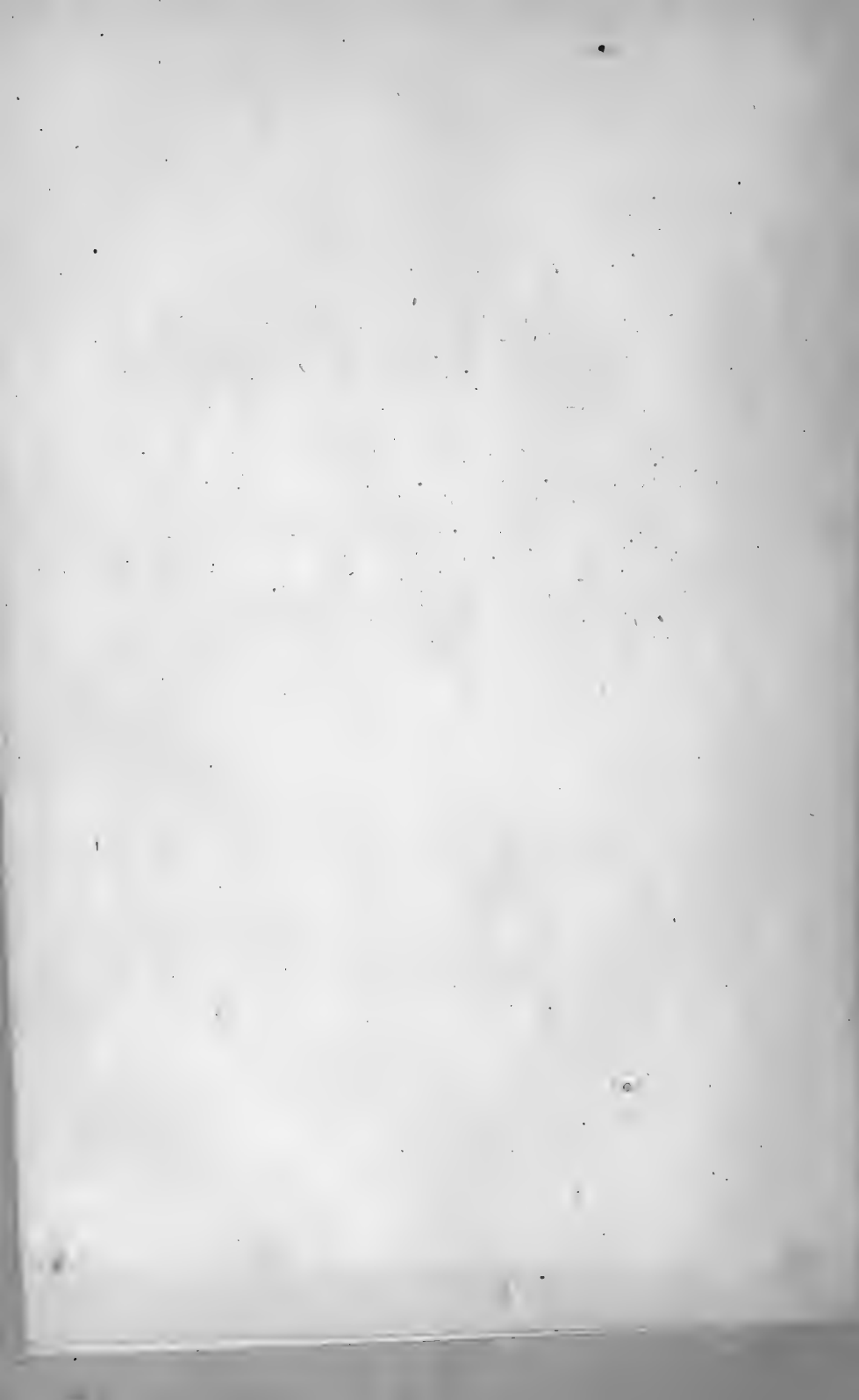


Being engaged in preparing a continuation of the work of my father, the late Dr. Amos Binney, on the "Terrestrial Mollusks and Shells of the United States," I take this opportunity of soliciting the assistance of those interested in the subject. Suites of local species from every part of the Union will be of great value to me in ascertaining the geographical distribution of species. They will be gratefully acknowledged, and, if required, shells given in exchange. I would also request any information relating to the subject, and any addenda or corrigenda to the "Mollusks."

Shells may be forwarded safely by mail, if packed in a pasteboard box, with tissue paper or cotton. Parcels exceeding the required weight of the Post-Office, may be sent by express.

W. G. BINNEY.

Address, Acad. of Natural Sciences, Philadelphia.



NOTES ON LINGUAL DENTITION OF CERTAIN SPECIES OF NORTH
AMERICAN LAND SHELLS.

BY THOMAS BLAND AND W. G. BINNEY.

We are indebted to Miss Annie E. Law, of Jalapa, Tennessee, and to Mr. Henry Hemphill, of Oakland, California, for the specimens from which we extracted the jaws and lingual membranes here described.

ZONITES LÆVIGATUS, Pf.

Jaw as usual in the genus.

ZONITES INTERTEXTUS, Binney.

The jaw and lingual membrane are as usual in the genus.

ZONITES DEMISSUS, Binney.

Jaw arched, ends attenuated, pointed; anterior surface smooth, cutting edge with well developed sharp median projection.

Lingual membrane as usual in the genus. Laterals above eight in number on either side of central line.

ZONITES LASMODON, Phillips.

Jaw and lingual membrane as usual in the genus.

ZONITES INTERNUS, Say.

The jaw and lingual membrane are those of *Zonites* (or *Hyalina*), and not of *Helix*, thus showing the generic position of the species, which is not so well marked by the shell.

The jaw is slightly arcuate, ends attenuated, pointed; median beak-like prominence to the cutting edge.

The lingual membrane is long and narrow. Central teeth large, with a long median cusp. Laterals like the centrals, but bifid, four in number, marginals aculeate.

PATULA STRIGOSA, Gould.

Jaw long, low, slightly arcuate; anterior surface smooth excepting near the lower margin, where there are numerous, crowded, subobsolete ribs, or coarse striæ, crenellating the cutting edge. There is a very strong muscular attachment to the upper margin.

The lingual membrane is as usual in the genus. (See fig. 129 of L. and Fr. W. Shells, I.) The marginal teeth are wide and low, with one inner, long, obtuse, oblique denticle, and several short side blunt denticles, obtusely rounded.

PATULA COOPERI, W. G. Binn.

Lingual membrane as in *Patula strigosa*.

PATULA IDAHOENSIS, Newc.

The jaw very much resembles in form and in its crenellated cutting edge that of *Patula striatella*. (See fig. 141 of L. and Fr. W. Shells, part I.) Its anterior surface has coarse perpendicular striæ or obsolete wrinkles, not well formed ribs. There is a stout membranous attachment to the upper margin. Lingual membrane as in *Patula Hemphilli*. (See Am. Journ. of Conch., VI. 247.)

PATULA PERSPECTIVA, Say.

The jaw and lingual membrane are quite like those of *P. striatella*. The ends of the jaw, however, are more squarely truncated, and the striæ are not converging.

HELIX POLYGYRELLA, Bland.

Jaw slightly arcuate, ends but little attenuated, blunt; anterior surface with fifteen broad ribs, denticulating either margin.

Lingual membrane as in *H. auriculata*.

We are indebted to Mr. Harford for the living specimens from which the notes on this species are drawn.

HELIX PALLIATA, Say.

Jaw short, high; anterior surface with more than fifteen ribs, denticulating either margin.

HELIX OBSTRACTA, Say.

Jaw with ten ribs. Lingual membrane as in *H. palliata*.

HELIX DEVIA, Gld. var.

This small, doubtful form from Salmon River, Idaho, has the jaw arcuate, ends blunt, with about seven stout ribs denticulating either margin. The lingual membrane is broad, teeth as usual in the genus, the marginals low, wide, with one oblique, bluntly bifid, inner denticle, and several short, blunt, outer denticles.

HELIX FIDELIS, Gray.

In Amer. Journ. Conch., VI. p. 207, pl. ix. fig. 1, we described and figured the jaw as short, high, thick, rough, strongly arcuate, ends attenuated, blunt, cutting edge with a well developed, blunt, median projection, marked with decided longitudinal striæ, which crenellate its margin. We have lately had an opportunity of examining numerous other adult specimens, and find them decid-

edly costate, usually with about six ribs, denticulating either margin.

PALLIFERA DORSALIS, Binney.

An opportunity has lately been given us by Mr. H. Prime of examining living specimens from Westchester Co., New York. We find Mr. Morse's description and figure of the jaw to be quite correct, and have no doubt of the genus being distinct from *Tebennophorus*. The species appears to us well marked also, especially by the great activity of the animal's motions.

Mr. Prime noticed it climbing on trees, a habit often observed by us in several of our land shells. Thus *Helix thyroides* in the garden of one of us at Burlington, N. J., constantly climbs the fruit trees, to eat the gum which exudes from the branches.

Our figure 535, of L. and Fr. W. Shells, part I., is defective. The head does not extend beyond the mantle. See the upper figure in Terrestrial Mollusks, III., pl. lxiii.

Oct 7, 1872

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XV. — *On the Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininae, with Notes on the Lingual Dentition of Succinea appendiculata Pfr.*

BY THOMAS BLAND AND W. G. BINNEY.

Read October 7, 1872.

[Reprinted from the *Annals of the Lyceum of Natural History*, N. Y., Vol. x, Oct., 1872.]

THE receipt from Governor Rawson of specimens preserved in alcohol of *Succinea appendiculata* and *Omalonyx unguis* Fér, collected in and sent to him from Guadeloupe, by M. Schramm, has afforded us the opportunity of studying their dentition and induced us to examine the relations of certain genera which have been placed in the sub-family *Succininae*.

Albers (2nd ed.) in group E, *Succinea*, has the following genera, viz., *Simpulopsis* Beck, and *Succinea* Drap., the latter divided into four sections, viz., *Amphibulima*, *Succinea*, *Brachyspira* and *Omalonyx*. He describes the jaw and refers to the lingual teeth in the following terms:—

Jaw arcuate, its convex margin extended into an almost quadrate plate; its concave margin striate or ribbed, with a short middle projection. Teeth of the lingual membrane as previously described (*i. e.*, tricuspid or bicuspid as in *Helicea*, etc.).

Simpulopsis BECK.

Beck (Index, p. 100) adopted this genus, but by name only. Shuttleworth (Bern. Mitt., 1854, p. 55) thus characterizes the animal:—

“Animal heliciforme, testa omnino inclusum, pede lato subtus transverse plicato: pallium exappendiculatum.

“Maxilla fere formam ferri equini habet, utroque latere dilatato-rotundato, medio autem angustata, costis 12 validis permunita, quarum 6 approximatae in parte angusta mediana, et in utroque latere 3 majores, magis remotae. Papillae in laminam lingualem in seriebus obliquis ordi-

natae, numerosae; centralis tridenticulata, denticulo medio elongata; mediae bidenticulatae, denticulo interno elongato, externo brevi; marginales latiores inaequaliter tridenticulatae, denticulis versus marginem exteriorem gradatim minoribus, interno autem valde producto.

"Genus naturale, *Vitrinae* nullo modo affine, sed *Succineae* proximum. Lamina lingualis autem diversa videtur (Cf. Phil. Handb., p. 243) atque etiam Maxilla (Cf. Terr. Moll. U. S., I, p. 213, pl. xiii, fig. 3)."

Heynemann (Mal. Blatt., 1868, p. 110, taf. v, f. 10) has description and figures of the teeth of *Simpulopsis sulculosa* Fér., mentioning that the jaw was not observed. On the accompanying plate we have given (Pl. ix, figs. 7, 8) copies of several of Heynemann's figures of the teeth, as many of our readers may not have access to the originals, and in a subsequent part of this paper we have described them.

With respect to the jaw not having been examined by him, Heynemann refers to that fact as rendering the correct classification of the genus difficult, but remarks that the form of the lingual teeth suggests relationship to the *Orthalicea** rather than to the *Succinea*, as shown by a comparison of the marginals with those of *B. auris leporis* and *papyraceus*.

H. and A. Adams (Genera, II, 127) adopt in *Succininæ* the following genera:—*Simpulopsis*, *Succinea*, *Amphibulima*, *Helisiga* and *Omalonyx*, enumerating as species of the latter, *O. unguis*, *appendiculata* and *depressa*.

On reference to our subjoined notes on the so-called *Succinea appendiculata* from Guadeloupe, it will be observed that the form of its teeth agrees generally with that ascribed by Heynemann to *Simpulopsis sulculosa*, while his suggestions as to the affinities of the latter genus (the jaw being unknown to him) are supported by our discovery of the character of the jaw in the Guadeloupe species. It must not, however, be overlooked that while the animal of *Simpulopsis* is entirely covered by the shell, that of the *S. appendiculata* under consideration is limaciform, like

* It must be remembered that we use the term *Orthalicea* in a much more restricted sense than the *Orthalicea* of Albers and von Martens. See our notes on Systematic Arrangement, Ann. N. Y. Lyc., x, p. 168.

O. unguis, as figured by Orbigny (Voy., t. 22, f. 1-7). With the form of jaw described by Shuttleworth and the quadrate marginal teeth, it would seem that *Simpulopsis* belongs to the *Helicinæ* and not to the *Succininae*. It may be noticed that, even form of shell alone considered, some of the species might appropriately be placed near to *Bulimulus*.

Guppy (Ann. and Mag. Nat. Hist., Jan., 1866) described *S. corrugatus*,* from Trinidad. Of the animal he says, "mantle edge narrowly reflexed over the peristome." Subsequently, the same author (Amer. Jour. of Conch., VI, 308, 1871) mentions having ascertained, from a young example of *S. corrugatus*, the characters of the dentition of *Simpulopsis*, and that it resembles that of *Succinea* more than he had anticipated. He says, "the odontophore is moderately large, but the individual teeth are very minute and resemble those of *Succinea*, particularly, perhaps, *S. ovalis*."

It seems to us that one important characteristic of the dentition of *Succinea*, absent in that of *Simpulopsis*, is the gap or notch in (as if by the cutting away of) the lower edge of the base of attachment in the central, and corresponding gap in the inner edge of the laterals.

Fischer and Crosse, in 1867, established the genus *Xanthonyx* (Jour. Conch., 1867, p. 221, et seq., pl. x, figs. 1-4), describing as the type *Vitrina Sumichrasti* Brot (*l. c.*, p. 70, pl. iv, fig. 2), and referred to the same genus *Simpulopsis Salleana*, *S. Cordovana* and (with some doubt) *S. Chiapensis*.

Among the generic characters of the animal of *Xanthonyx*, derived from examination of a specimen of *X. Sumichrasti*, communicated by Brot, are the following, "Animal testa sua multo majus, haud omnino inclusum," and "maxilla arcuata, costata; tæniola lingualis dentibus basi subquad-

*Guppy compares his species with *S. Brasiliensis* (Syn. of *S. obtusa* Sow.), from which indeed it seems scarcely distinguishable.

ratiss, inæqualiter bicuspidatis (dente medio tricuspidato) instructa.”*

With respect to *X. Salleanus* and *Cordovanus*, the authors state, on the authority of Sallé, that the animals are much larger than their shells, as in *X. Sumichrasti*.

Xanthonyx, as well as *Simpulopsis*, belongs to *Helicinæ* and not to *Succininæ*.

Succinea DRAP.

Amphibulima.—Albers (*l. c.*, 309) gives as the type of this section of *Succinea*, *A. patula* Brug., but without any special description of animal or its dentition.

Guppy (*Ann. and Mag. Nat. Hist.*, June, 1868) mentions the occurrence in Dominica of *A. patula*, and we were indebted to him for the lingual membrane (without jaw), of which we published figure and description in *Amer. Jour. Conch.* VII, 186 (1871), pl. xvii, fig. 1–2. Guppy does not particularly notice the animal, and we assume in consequence that, as in *Succinea s. s.*, it is capable of retraction within the shell; indeed the form and character of the shell preclude any other supposition.

Guppy (*l. c.*, June, 1868) describes another species, found by him in Dominica, as *Amphibulima pardalina*, the animal of which he describes as follows:—

“The animal resembles that of *Omalonyx unguis* Fér. (*D'Orb. Voy. Amer. Mer.* pl. xxii, fig. 1–7). The foot is translucent, like a bit of ice dipped in milk, the internal organs showing as a dark, variegated patch about the shell, into which the body is incapable of retraction.”

Guppy adds (and apparently he was acquainted with the dentition [not the jaw], of *A. patula* only):

*Fischer and Crosse (*Études sur les Moll. Terr. et Fluv. du Mexique et du Guatemala*, 192–199, pl. 9, figs. 14–17) give a more detailed description of *Xanthonyx*, and remark on certain of its affinities with the genus *Binneya*. The part of the work referred to reached us after our manuscript was in the printer's hands.

"Forming my judgment from the soft parts and the lingual dentition, I should separate *Amphibulima* as a genus from *Succinea*. The genus *Amphibulima* might then be divided into the following groups:—

<i>Amphibulima</i> s. strict.	Type <i>A. patula</i> .
<i>Omalonyx</i> D'Orb.	" <i>O. unguis</i> .
<i>Brachyspira</i> Pfr.	" <i>A. pardalina</i> and <i>tigrina</i> ."

Without knowledge of the jaw of *Amphibulima*, and we scarcely think that the genus can be elasmognathous, we are unable to decide whether it belongs to *Succininae* or not, but have a strong impression that its proper position is in *Helicinae*.

The dentition of *Amphibulima*, as shown in our figure, does not materially differ from the form usual in the *Helicidae*, excepting in the marginal teeth, which are very long and narrow. The cutting away of the plate, before referred to as characteristic of *Succinea*, is entirely wanting in *Amphibulima*.

v. Martens (Zool. Record, 1868, p. 491) observes that "Mr. Guppy reestablishes *Amphibulima* as a genus distinct from *Succinea* (Drap.) on account of its different lingual dentition, but without pointing out the difference."

Succinea s. strict.—The animal, lingual dentition and form of jaw need no special notice in the present paper. We would express, however, the opinion that those species only, to whatever group or section they belong, which are elasmognathous, should be admitted in *Succininae*.

There are several elasmognathous genera with animals of varied forms on which we have no occasion here to remark.

Brachyspira Pfr.—This group is based on the form of shell, and it is worthy of notice that Albers (ed. 2) gives as the type *S. tigrina* Lesueur, which is very near to, if not identical with, as Guppy remarks, his *A. pardalina*. If the animal of the latter be as described by Guppy, we certainly should not place the species in *Brachyspira*, which belongs rather to *Succinea* than to *Amphibulima*.

Tryon (Amer. Jour. Conch., II, 236–241, 1866) refers

many species of North American *Succinea*, we think erroneously, to *Brachyspira*. In *Land and Fresh Water Shells of North America* (1869) we adopted the latter in the sense in which it is used by Albers (ed. 2).

Omalonyx D'ORB.

Albers (*l. c.*, 311) refers to *O. unguis* Fér. as the type of this group. D'Orbigny (*Voy.*, 229, t. 22, figs. 1-7) gives the following description of the animal :

"Allongé, ovale, déprimé, beaucoup trop grand pour rentrer dans la coquille, occupant près de trois fois la surface de celle-ci; pied très large débordant de toutes parts, arrondi en avant, acuminé postérieurement, lisse en dessous et en dessus; manteau formant un bourrelet autour de la coquille, qu'il recouvre sur les bords, étroit en arrière, plus large et comme plissé en avant; col assez long; tête étroite; tentacules courts; orifice des poumons sous le bord droit du manteau, vers sa partie moyenne."

Fischer (*Mélang. Conch.*, p. 67, pl. vi, f. 1) describes the animal of *O. unguis* and its dentition.

Sometime since we were indebted to Mr. John G. Anthony for specimens collected by him (Agassiz' expedition) in Brazil, and found, on examination of the jaw and lingual dentition, that both agree with the figures given by Heyne-mann (*Mal. Blatt.*, 1868, taf. iv, fig. 5) of the jaw and teeth of *Pellicula convexa* Martens, of which figures we add copies (plate ix, figs. 12-14).

As already mentioned, we have lately received from Governor Rawson specimens in alcohol of animal and shell of *O. unguis*, collected in Guadeloupe by Schramm, and find that both jaw and teeth are precisely similar to those of the Brazilian examples.

It appears, irrespective of form of animal and shell, that should even *Amphibulima* prove like *Omalonyx* to be elasmognathous, the lingual dentition of the latter does not warrant its being treated, as proposed by Guppy, as a section of the former genus.

Guppy has lately discovered in Trinidad, but not yet, we

believe, described, another species of *Omalonyx*, the shell of which he has communicated to Governor Rawson, with the name *Amphibulima* (*Omalonyx*) *felina*. Indebted to Mr. Rawson for an opportunity of examining the shell, we find, as the author remarks in a letter accompanying the specimens, no appreciable distinction between it and the Guadeloupe *O. unguis*.

In a late letter Mr. Guppy states that "the animal of *O. felina* resembles in general character *O. unguis*, *O. par-dalina* and *A. patula*, the latter being much larger, darker, more strongly colored and more coarsely striated."

The Guadeloupe specimens received from Gov. Rawson, collected and labelled by Schramm *Succinea appendiculata*, are extremely interesting and not a little perplexing, indeed Schramm, judging from his notes sent with them, rather suggests, that *S. appendiculata*, *depressa* and *O. unguis* are all one and the same species.

Succinea depressa Rang (Guer. Mag., 1834, t. 55) is a species as to which there seems to be much uncertainty. Fischer described it, the animal and its dentition, as *Pellicula depressa* in Act. Soc. Linn. Bord. XX, 5, to which we have not had an opportunity of referring, and also in Mélang. Conch. p. 67, t. vi, f. 19.

In the latter work, the jaw and teeth are thus characterized :—

"Mâchoire semblable à celle des Limaces, et portant une quantité de denticulations. Plaque linguale se rapprochant de celles des Ambrettes. Epines médianes trifides; latérales bifides."

We give copy of the figure of the jaw on plate ix, fig. 4.

Petit (Jour. Conch., 1856, p. 154) expresses the opinion that *S. appendiculata* Pfr. is the same species, Rang's specific name having priority, but Pfeiffer (Mon., IV, 804) referring to Rang's figure, maintains that they are distinct.

The character from which the specific name of Pfeiffer's species is derived, he describes (Mon., II, 531) thus; "col-

umella callosa, aperta, appendicula dilatata, torta superne munita," adding in a footnote, "Forma persimilis præcedenti (*S. depressa* Rang), at bene distincta columella appendice torta quasi duplicata, spira subpapillatim prominula et peripheria magis regulari." This appendage is shown in our figure (pl. ix, fig. 6) of Rawson's *appendiculata*.

v. Martens (Malak. Blatt., 1868, p. 183) described *Succinea* (*Pellicula*) *convexa*, to the dentition of which by Heynemann we have already referred, giving also (plate ix, figs. 12–14) copies of his figures.* One of the characters of this species is said to be by its author, "paries aperturalis appendicula parva, plicæ-formi munitus."

With respect to the validity of his species, v. Martens adds a note to the following effect,—*S. depressa* Rang, as its name implies, differs from our species by being less arched. Pfeiffer writes that *P. convexa* is by no means the same as his *S. appendiculata*. If the latter be identical with *depressa* as Fischer maintains, then Rang's figure is entirely faulty, the most essential character, the process on the columella, being overlooked.

A comparison of the figures presented on plate ix, will show that the *Pellicula depressa* of Fischer has a ribbed jaw (fig. 4), and does not belong to the *Succininae*,† while *Pellicula convexa* v. Martens is elasmognathous, like *Succinea* (fig. 14).

It seems to us that *S. depressa* of Fischer must be treated as the type of *Pellicula*, while *S. convexa* belongs to *Omalonyx*.

Albers (ed. 2) does not include in *Omalonyx* or other group *S. depressa* or *S. appendiculata*, mentioning them only in a remark of the following purport:—

* v. Martens (Zool. Record, 1868, p. 492), referring to Heynemann's figure, says "proving that *Pellicula* is not generically distinct from *Succinea*,"—a proposition in which we do not concur. H. & A. Adams (Genera, II, 568) inconsiderately remark that *Pellicula* Fischer is syn. of *Helisiga*, and founded upon *H. depressa* Fischer, a new species of that genus.

† Mörch (Jour. Conch. 1865, p. 384) places *Pellicula* in his section *Odontognatha*.

Succinea appendiculata, identical with *S. depressa* Rang, is made by Fischer the type of a separate genus, *Pellicula*, after an examination of the jaw, lingual dentition and generative organs; Albers (*l. c.*) adds that he had not yet been able to decide upon the correctness of those views.

From the subjoined diagnosis of the species received as *Succinea appendiculata* from Guadeloupe, it will be seen that the animal is limaciform, has a jaw, not as in *O. unguis*, but allied to that of genera and species of *Helicinæ*, and teeth agreeing somewhat closely with those of *Simpulopsis*. In pl. ix, we give figures of the animal (from an alcoholic specimen), of part of the jaw and teeth (Figs. 2, 9, 10, 11).

We now proceed to describe the jaw and lingual membrane of *Succinea appendiculata* Pfr., received from Governor Rawson:

Jaw extremely thin and transparent, long, low, slightly arcuate, ends blunt, divided longitudinally by about 40 delicate ribs into as many plate-like sections, of the character found in the jaws of *Cylindrella*, *Macroceramus* and many species of *Bulimulus*. No appearance of triangular upper median plates, however, as in *Cylindrella*, though the two specimens examined by us are not perfect at that part. Both margins serrated by the extremities of the ribs. The general character of these ribs is the same as in *Helix turbiniformis*, figured by us in Ann. of Lyc. of Nat. Hist. N. Y. x, pl. 2, fig. 2. The jaw is quite membranous.

Lingual membrane as usual in the *Helicinæ* proper (see Ann. Lyc. Nat. Hist. N. Y. x, 163). Centrals subquadrate with a very large, stout, short, pointed cusp, the side cusps obsolete. Laterals larger and more narrow than the centrals, bicuspid, the inner cusp greatly produced, broad and quite squarely terminating. The base of attachment of the laterals is cut away on the inner side, leaving a large outer lateral expansion, bringing to mind the much less developed one of *Succinea*. Marginal teeth quadrate, gradually becoming modified from the laterals, the cusps finally passing off into simple, obtuse papillæ, the inner one the larger.

The central and lateral teeth are like those of *Simpulopsis sulculosa* as figured by Heynemann in Malak. Blatt. xv, pl. 5, fig. 10, the central, however, bearing a much more developed cusp in our species. The marginals in that figure, of the form found in *Bulimulus aurisleporis*, *papyraceus*, *laticinctus*, etc., we failed to detect in our species. As already stated, we found the marginals merely a modification of the laterals.

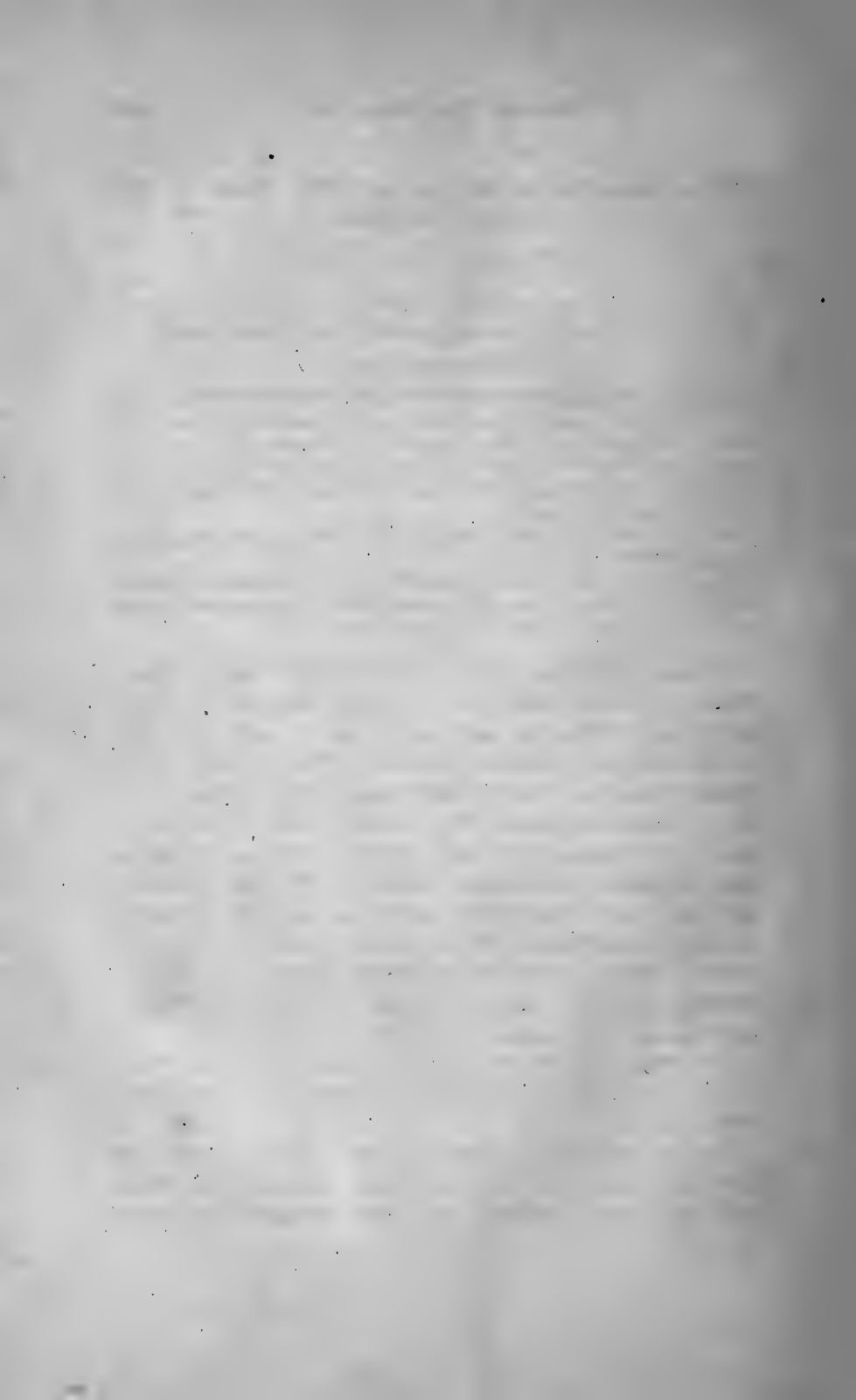
The above description does not agree with that given by Dr. Fischer (*Mélanges Conch.*, 69, t. vi, fig. 19) of *Pellicula*

depressa, which we have already quoted. He describes the jaw as having a number of ribs on its anterior surface pectinating the cutting margin, actually nine of them being shown in his figure. He also describes the lingual dentition as quite different, the centrals being represented with one large bifid median cusp and one small cusp at either side. His figure of the lateral teeth is also simply bicuspid, the figure of the inner cusp does not show any trace of the peculiar prolongation and blunt termination, described by us above. For convenient reference we copy Fischer's figure of the jaw (Plate ix, fig. 4).

The external appearance of our animal is the same as described by Fischer in the paper referred to. Little confidence, however, can be placed on the external characters of the animals of this group, that of *O. unguis* being, as Fischer remarks, nearly the same as of the species under consideration.

As already mentioned, *P. convexa* v. Mart., from its form of jaw, cannot be placed in Fischer's genus *Pellicula*, while the *appendiculata* examined by us has jaw (as well as teeth) of different character from that assigned by Fischer to *Pellicula depressa*, but for the present we refer, with doubt, our species to *Pellicula*; most certainly it does not belong to *Succinea*.

We appear to be warranted in assuming that Mr. Rawson's *appendiculata* is Pfeiffer's species, specifically and probably generically distinct from *S. depressa* Fischer. Whether the latter is or is not the *S. depressa* Rang we are unable to decide.



XVI. — Description of *Hemphillia*, a New Genus of Terrestrial Mollusks.

BY THOMAS BLAND AND W. G. BINNEY.

Read October 7, 1872.

[Reprinted from the Annals of the Lyceum of Natural History, N. Y., Vol. x, Oct., 1872.]

Hemphillia.

Animal limaciforme, parvum, antice obtusum, postice attenuatum. Pallium subcentrale, magnum, ovatum, antice valde productum, marginibus liberis. Discus gressorius distinctus nullus. Porus mucosus transversus in apice pedis, processu coniforme valido protectus. Apertura respiratoria ad dextram, in medio marginis inferioris pallii, genitalis ad basin tentaculi dextri oculigeri.

Testa externa, unguiformis, subquadrata, replicatura pallii marginorum breviter inclusa.

Maxilla et lamina lingualis ut in *Arione* constituta, dentes centrales tricuspidatæ, laterales bicuspidatæ, marginales quadratæ, bicuspidatæ, papillis internis valde productis, externis subobsoletis.

Animal limaciform, small, blunt in front, tapering behind. Mantle subcentral, large, oval, greatly produced in front, free around its margin and slightly reflected over the edges of the shell. No distinct locomotive disk to foot. Lines of furrows run near and parallel to edge of foot, rising above the extremity and apparently uniting over a transverse, mucus slit, overhanging which is a greatly produced horn-shaped process. Respiratory orifice at right edge of mantle, near its centre. Generative orifice at right side of neck, near right eye peduncle (Plate ix, figs. 1 and 3).

Shell external, its edges imbedded lightly in the mantle, very thin, unguiform, almost as large as the mantle (in specimens preserved in alcohol) (Plate ix, fig. 5).

Jaw wide, low, slightly arcuate; ends blunt, but little attenuated; anterior surface with numerous ribs denticulating either margin.

Lingual membrane as usual in the *Helicidæ*. Teeth in *Hemphillia glandulosa* about 23—1—23. Centrals and laterals long, the former tricuspid, the latter bicuspid; marginals

about twelve, quadrate, the inner cusp long, narrow, oblique, bluntly pointed, outer cusp subobsolete (Plate ix, figs. 15-17).

***Hemphillia glandulosa*.**

Animal, shell, jaw and lingual membrane as already described above under *Hemphillia*. (See Plate ix.)

Animal about 12 mill. long (preserved in alcohol); color smoky white, mottled with longitudinal, dark brown blotches, running obliquely from the edge of the mantle to the foot, uniformly with the coarse granulations, of which we counted about twenty-five on either side of the animal. Caudal process very large, triangular in profile, dark brown, with a few coarse granulations.

Shell unguiform, slightly convex, light horn-color, very thin, its edges almost membranous, with prominent concentric lines of growth; five mill. long, three wide.

Habitat.—Astoria, Oregon: Mr. Henry Hemphill.

Our description is drawn from specimens preserved in alcohol, due allowance for which fact must be made. They were collected at Astoria, Oregon, by Mr. Henry Hemphill, to whom we dedicate the genus in return for most valuable addition to our knowledge of the land shells of the Pacific region.

This curious slug, by its general outline and by the form and position of its shell, may be compared to *Omalonyx unguis* D'Orb, and the species known formerly as *Succinea appendiculata* Pfr., but now usually referred to *Pellicula*. The former has, however, a jaw with the supplementary extension as in *Succinea*, the latter has the jaw usual in *Bulimulus* and *Cylindrella*, while neither of them has the prolongation of the mantle. Both of those genera also are readily distinguished by their shell being more developed and approaching a spiral form.

Hyalimax is distinguished from *Hemphillia* by its Succinea-like jaw. Otherwise, it resembles our genus in its general

outward appearance, and by its non-spiral shell. This shell, however, in *Hyalimax* is almost, if not completely, internal, while the shell of *Hemphillia* is entirely exposed.

Binneia, in its prolonged mantle and costate jaw, resembles *Hemphillia*, but its shell is much more developed, spiral, striate and almost capable of protecting, though not absolutely including, the animal when contracted.

Xanthonyx and *Simpulopsis* are both described with costate jaw, but they have both highly developed, decidedly spiral shells.

Finally, from all the above mentioned genera and from all known sublimaciform genera, our genus is at once distinguished by the peculiar hump-like process on the tail, reminding one of the caudal process in *Nanina*.

EXPLANATION OF PLATE IX.

Fig. 1. *Hemphillia glandulosa*.

The caudal extremity greatly enlarged.

Fig. 2. *Succinea appendiculata* Pfr.

From Governor Rawson; a portion of the jaw.

Fig. 3. Same as fig. 1, enlarged.

From a specimen preserved in alcohol.

Fig. 4. *Pellicula depressa* Rang.

The jaw; copied from Fischer, Mél. Conch., l. c.

Fig. 5. Same as fig. 1. The shell, enlarged.

Seen from above.

Fig. 6. *Succinea appendiculata* Pfr.

From Governor Rawson, slightly enlarged, the right hand figure showing profile of appendage.

Fig. 7. *Simpulopsis sulculosa* Fér.

A marginal tooth, copied from Heynemann, Mal. Blatt., 1868, pl. v, fig. 10.

Fig. 8. Same as fig. 7; centrals and laterals.

Fig. 9. *Succinea appendiculata* Pfr.

From Governor Rawson; centrals and laterals.

Fig. 10. The same; marginal tooth.

Fig. 11. The same ; external view of animal contracted in alcohol.

Enlarged about one half.

Fig. 12. *Pellicula convexa* Martens.

Centrals and laterals ; copied from Heynemann, *l. c.*, pl. iv, fig. 5.

Fig. 13. The same ; marginal tooth.

Fig. 14. The same ; jaw.

Fig. 15. *Hemphillia glandulosa*.

Extreme marginal teeth.

Fig. 16. The same ; first marginal teeth.

Fig. 17. The same ; central and lateral teeth.

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XIX—On the Lingual Dentition of Certain Terrestrial Pulmonata Foreign to the United States.

BY THOMAS BLAND AND W. G. BINNEY.

Read Dec. 9, 1872.

[Reprinted from the Annals of the Lyceum of Natural History, N. Y., Vol. x, Oct., 1872.]

Helix Jayana, C. B. ADAMS (*Sagda*).

Like *Sagda connectens* C. B. Adams and *Sagda Haldemaniana* C. B. Adams (see Amer. Jour. Conch. VII, p. 175), this, also a Jamaica species, has quadrate, not aculeate, marginal teeth on its lingual membrane. The cusps of the marginals are short, stout and blunt, centrals and laterals as usual.

Jaw smooth anteriorly, with scarcely any median projection to its cutting edge.

This is an additional proof of the position of *Sagda*

being among the *Helicea* rather than the *Vitrinea* of von Marten's arrangement.

We received from Mr. Henry Vendryes the specimen examined.

***Leucochroa Boissieri*, CHARP.**

The genus *Leucochroa* is adopted by von Martens (Die Heliceen ed. 2, p. 78) the type being *Helix candidissima* Drap, a species whose anatomy has been described by Moquin-Tandon as being more nearly related to *Zonites*, than to *Helix*. The genus is classed by von Martens among the *Vitrinea*, the section of *Helicea* containing the genera furnished with ribless anterior surface and median projection to the jaw, and aculeate, marginal teeth to the lingual membrane. Among the species catalogued by von Martens is *Leucochroa Boissieri* Charp. Having sometime since received a specimen of this species from Mr. John Van Nostrand, collected by him in Palestine, we have examined its jaw and lingual dentition with the following results.

Jaw very low, long, arcuate, ends but little attenuated, bluntly rounded. Cutting edge with a decided median projection, anterior surface free from ribs, with a strong, transverse line of reinforcement. The jaw resembles that of *Clausilia* or *Pupa* more than that usually found in *Helix*.

Lingual membrane as usual in the *Helicidae*. Centrals short and stout with a bluntly pointed median tooth, the side teeth almost obsolete. Laterals with a very long, oblique, blunt inner tooth, the outer tooth almost obsolete. Marginals subquadrate, with several short, blunt, papillæ-like teeth.

From the above it will be seen that *Leucochroa Boissieri* must be classed among the *Helicea*, its lingual membrane having the quadrate type of marginal teeth, and not the aculeate type common to *Vitrina*, *Zonites* and other *Vitrinea*. Its jaw is of the form often found in the *Helicea*. Judging from both jaw and lingual membrane, we would not separate the species from the genus *Helix* as received by von Martens. We are inclined to believe that further investigations will

prove the genus *Leucochroa* to be only a subgenus of *Helix*, in the arrangement of "Die Heliceen."

***Helix circumfirmata*, REDFIELD.**

Lingual membrane long and broad, centrals tricuspid, laterals bicuspid, cusps long and slender, marginals aculeate.

From the above description it will appear that this species belongs to the *Vitrinea* rather than to the *Helicea* of von Marten's arrangement, in which latter it is classed in "Die Heliceen" as a species of the subgenus *Microphysa*.

***Helix Bermudensis*, PFR.**

Jaw extremely thin, arched, with a blunt, median projection to its cutting edge.

Lingual membrane long and narrow. Central teeth tricuspid, laterals bicuspid; the cusps in each long and slender. Marginals numerous, aculeate in oblique rows.

As in the *H. circumfirmata*, the result of our examination of the lingual membrane throws light on the generic position of this species. It can no longer be retained in *Caracolus*, a sub-genus of *Helix*, as it has the dentition of the *Vitrinea* of von Marten's arrangement. For the specimens examined of this and the preceding species, both from Bermuda, we are indebted to Mr. J. J. Crooke.

***Helix perplexa*, FER. (*Dentellaria*).**

Jaw with a median projection to its cutting edge. The anterior surface of the jaw is of irregular thickness, showing some approach to the ribbed form of jaw.

Lingual membrane as usual. Central and lateral teeth with short, stout, blunt cusps. Marginal teeth quadrate, with one wide, stout, bluntly rounded median cusp, and two small, blunt side cusps.

We are indebted to Governor Rawson for this specimen collected in the Island of Grenada.

Pupa sulcata, MULLER (*Gonidomus*).

Lingual membrane long and very narrow. Rows of teeth arranged *en chevron*. Teeth separated, aculeate, as in *Pupa palanga* Lesson, photographed by us (Amer. Jour. Conch. V, pl. XI, fig. 1.)

We obtained no jaw on boiling the buccal mass in a solution of caustic potash.

This species belongs to the genus *Gonospira*, in which *P. palanga* was placed by Crosse and Fischer (Journal de Conch. IX, 213 (1869), pl. XI, figs. 6-8).

The specimen examined, sent from Mauritius by Consul Pike, was kindly supplied by Mr. John G. Anthony.

Bulimus aulacostylus, PFR. (*Eurytus*).

Lingual membrane as usual in the genus, the marginal teeth simply modified from the laterals.

Jaw slightly arcuate, membranous, almost transparent, in one single piece, but divided by delicate ribs into more than sixty plate-like sections, as common in the genera *Bulimulus*, *Cylindrella*, etc. No upper median triangular plate, but the ribs run somewhat obliquely to the centre.

We are indebted for this specimen from St. Lucia, and for the following from St. Vincent, to Governor Rawson.

Bulimus auris-sileni, BORN (*Pelecychilus*).

Jaw and lingual membrane as in the last species. The middle cusp of the central teeth and inner cusp of the lateral teeth long, acute.

The jaw of this and the preceding species do not agree with the generic description of von Martens "costis validis exarata," but are like that of *Bulimulus*. This fact gives still more proof of the difficulty of classifying the *Bulimi* by their jaw, at the present stage of our knowledge of the subject, as already remarked by Fischer (Jour. de Conch. XII, 295, 1872).

ADDITIONAL NOTE ON THE GENUS AMPHIBULIMA.

Since our paper "On The Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininae, with Notes on the Lingual Dentition of *Succinea appendiculata* Pfr." (pp. 198-207) was printed, we have received, through the kindness of Dr. W. J. Branch of the island of St. Kitts, two specimens of *Amphibulima patula* with the animals, preserved in glycerine, and can in consequence offer a decided opinion as to the generic relations of the species.

Finding a note among the papers of the late Mr. Robert Swift to the effect that "*S. patula* Brug. is found at St. Kitts on Bayford's estate on the wild plantain which grows on the banks of a small water-course," Bland wrote on the 21st November last, requesting Dr. W. J. Branch, a correspondent of Mr. Swift and also of Governor Rawson, to obtain specimens, if possible, for examination. To this request Dr. Branch most kindly responded. We subjoin copy of his interesting letter, which accompanied the specimens.

"I went a few days ago to Bayford's to look for the *S. patula* but, after a long and fatiguing search, found only two small (young) specimens. When I was in the place several years since, the bushes on each side of the little river were covered with snails* (a striped *Bulimus*, a species of *Helicina* and the *S. patula*), but the other day I saw only three arboreal snails. The present scarcity of these creatures in St. Kitts is probably due to the hurricane which visited the island in 1870. Many trees, some of enormous size, were torn up by the roots, others lost all their branches, and scarcely a single leaf was left on any tree. The supply of water to the estates was cut off or much diminished by the drying up of the numerous streams from the mountains. This was, no doubt, caused by the want of foliage to protect the moisture, which collects on the slopes of well-wooded hills, from the sun's heat. So the poor snails have come to grief from the actual violence of the hurricane itself, and the subsequent cutting off of their supplies both of meat and drink.

You will see that both the snails sent are completely tucked into their shells, but I do not think that they often, or perhaps ever, draw in either the head or the posterior part of the foot during life. Their flesh is partic-

* *B. multifasciatus* Lam. and *H. fasciata* Lam. (T. B.)

ularly watery and gelatinous and shrinks up as they die. When they are moving about, the foot looks very large and when I touched the creature it could not or would not retreat into its shell. On this point, however, I shall be able to give more accurate information when I can collect additional specimens."

We find that the animals are completely retracted into their shells and very much in the same manner as in *Succinea*, little more than the entire surface of the foot being alone seen within the aperture, the edges of the peristome projecting slightly beyond it. While the sensitiveness of the animal to touch may be slight and its habit as described by Dr. Branch, they cannot be said to be much larger than their shells, as remarked by Sallé of *Xanthonyx*, and described by Fischer and Crosse, or as described by Dr. Cooper of *Binneia*. The specimens for which we are indebted to Dr. Branch, must have been taken alive in the month of December, and very soon at least after death, before becoming dry, put in the glycerine.

It will be remembered that Guppy considers *Omalonyx* and *Brachyspira* as groups or sections of *Amphibulima*. In a very recent letter he repeats his assurance that "the animals of both *Amphibulima patula* and *pardalina* are very much larger than the shells and quite incapable of retraction into them." His observation agrees, so far as it goes, with that of Dr. Branch, who adds a remark as to the shrinking up of the animals "as they die." This shrinking before death must be accompanied by the exercise of contractile muscular force, and probably further observation will prove that the animal, while in possession of its full vital power, can and does withdraw itself into the shell, and especially, perhaps, in seasons of drought.

The jaw of *A. patula*, of which we subjoin description, has not the accessory plate characteristic of *Succinea*, and which is found in *Omalonyx* and *Brachyspira*; while the latter subgenera therefore belong to the *Succininae*, *Amphibulima* must be associated with the *Helicinae*. By the character of the ribs of the jaw, it is most nearly allied to the

genus *Bulimulus*. The same may be said of *Gæotis* lately examined by us.

Amphibulima patula.—Body obtuse in front, pointed behind, entirely retractile within the peristome, though usually greatly expanded. Mantle simple as in *Succinea*, *Helix*, etc. Base of foot wrinkled transversely, without distinct locomotive disk. Generative orifice? Respiratory orifice?

Jaw slightly arcuate, low, ends attenuated: extremely thin and transparent with prominent transverse striæ; divided longitudinally by about forty-five delicate ribs into so many plate-like sections of the same character as those of *Cylindrella*, *Macroceramus* and many species of *Bulimulus*. No upper triangular median plates as in *Cylindrella*. Margin serrated by extremities of ribs.

The figure we have given of the jaw of *Succinea? appendiculata* Pfr. (Ann. Lyc. Nat. Hist. N. Y., X, pl. ix, fig. 2) offers a correct general idea of the jaw of *Amphibulima patula*. See also our photograph of jaw of *Cylindrella rosea* (Am. Journ. Conch., V, pl. xi, fig. 2) for the character of the ribs and plate-like sections.

Lingual membrane as already described and figured by us from a specimen from Dominica (See Am. Journ. Conch., VII, 186, pl. xvii, figs. 1-2), long and broad, composed of numerous horizontally waving rows of teeth, of the form usual in the *Helicidæ*. Centrals subquadrate, extended at basal angles, narrowing towards the centre, expanding towards the upper edge, which is reflected and tricuspid, extending quite to the base of the tooth; the cusps are stout, the median one bluntly pointed. The lateral teeth are of the same type as the centrals, but unsymmetrical. The marginals are long and narrow, rounded at base, narrowed at apex, reflected and bicuspid; cusps short, stout, and generally a simple modification of those of the laterals. The extreme marginals have irregular teeth, like simple papillæ.

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XXI. — *On the Lingual Dentition of Gæotis.*

BY THOS. BLAND AND W. G. BINNEY.

Read January 6, 1873.

[Reprinted from the *Annals of the Lyceum of Natural History*, N. Y., Vol. x, Oct., 1872.]

THE genus *Gæotis* was described by Shuttleworth,* founded on a curious mollusk from Porto Rico. The lingual dentition was said to be nearly the same as in *Vitrina* and *Zonites*, the teeth arranged in oblique rows, centrals obtusely tri-

*“*Lamina lingualis fere ut in Vitrina et Zonites constituta videtur, papillæ nempe numerosæ in seriebus utrinque obliquis ordinatæ sunt: papilla centrali obtuse tri-dentata; mediis vix a centrali diversis; lateralibus autem subulato-productis, arcuatis basi? bifurcatis. An maxilla adsit hæret.*” “E formatione linguæ animal videtur sine dubio carnivorum.” Shuttleworth, *Bern Mit.* 1854, p. 34.

dentate, laterals scarcely differing from the centrals, marginals lengthened, awl-shaped, arcuate, at base ? bifurcate. The presence of a jaw was not verified by Shuttleworth. The character of the dentition was considered such as to denote carnivorous habits of the animal.

This is all the information as to the lingual dentition of *Gæotis* hitherto published. Mörch, indeed, places the genus (Jour. de Conch. 1865, 384) in his section *Odontognatha*, which comprises the Terrestrial Pulmonata furnished with a ribbed jaw, not from any original investigations, but simply from its assumed identity with *Parmacella*, a genus believed to have a ribbed jaw, judging from the obscure figure given by Férussac of the mouth of *Parmacella palliolum* (Hist. t. 8 A, fig. 8). Shuttleworth's description rather indicates the form of dentition figured by us (Land and Fresh Water Shells, I), of many species of *Vitrina*, *Hyalina* and *Zonites*. The bifurcated base of the marginal teeth may even be supposed to be such as we have figured (l. c. 17) in the centrals of *Glandina truncata*.

We have long had in our possession the jaw and lingual membrane of a specimen of *Gæotis* from Porto Rico. The animal was received many years ago by one of us (Bland) from the late Mr. Robert Swift, the alcohol in which it was originally preserved evaporated, and the jaw and lingual membrane were, not very long since obtained, by maceration, in a somewhat imperfect condition. Comparing the latter with Shuttleworth's description, we find that at first we had misunderstood his words, which, indeed, are quite liable to mislead, especially in the infelicitous comparison with *Vitrina* and *Zonites*. We give, therefore, a more detailed description and figure, in order to prevent further errors.

Jaw (plate xi, fig. 1) long, low, slightly arcuate, ends attenuated, extremely thin and delicate, transparent: in one single piece, but divided by over forty* delicate ribs into as many plate-like compartments of the type

* Fragments only of the jaw were saved; the largest one we have figured, and from it estimate the whole number of ribs.

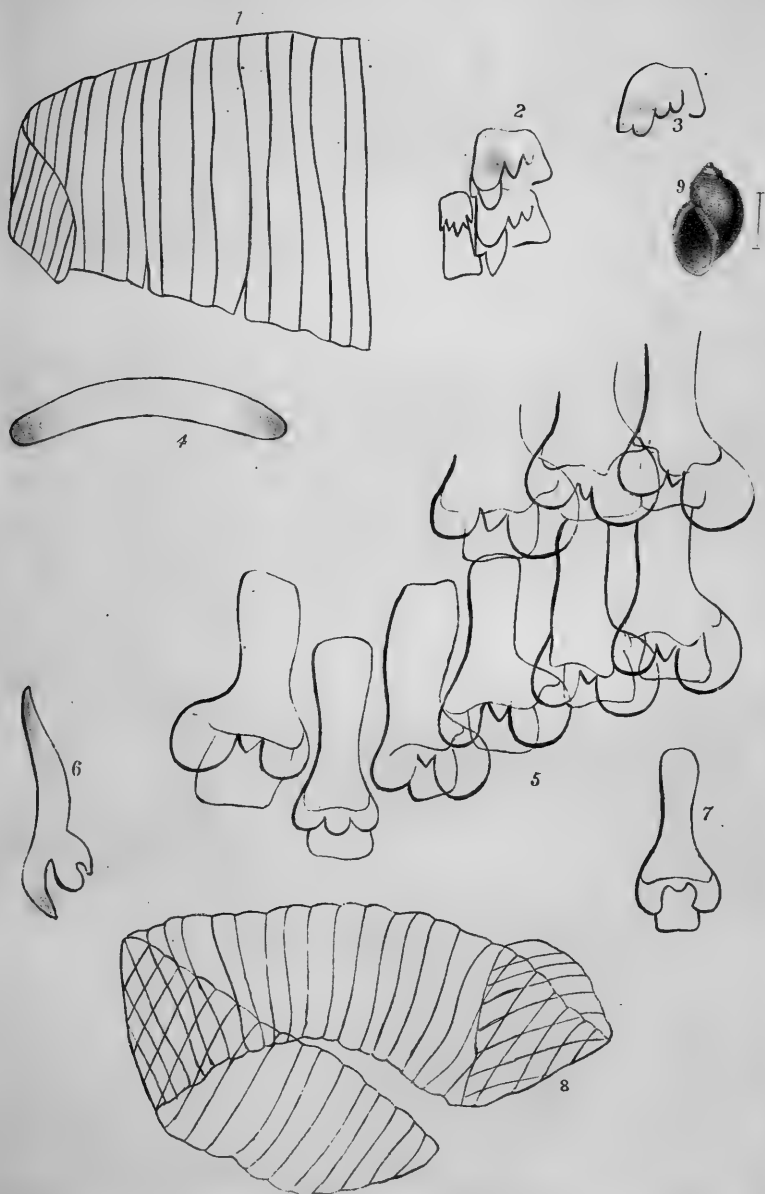
common in *Bulimulus* and *Cylindrella*, but without the upper median triangular plate characteristic of the latter; both margins scarcely serrated by the ends of the ribs.

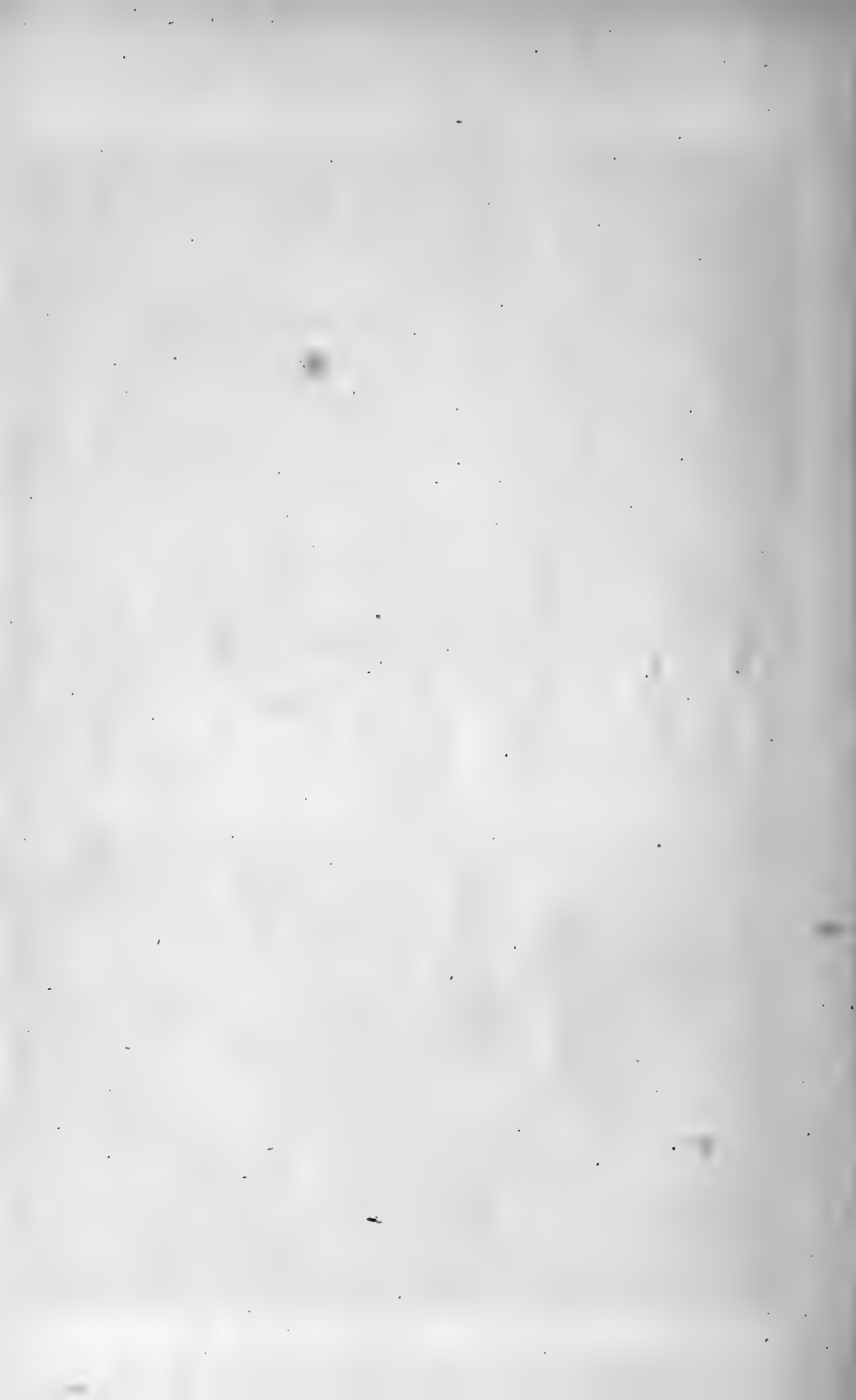
From our numerous observations on the jaws of *Pulmonata* (see Ann. Lyc. N. H. of N. Y., X, 165), we consider this to be a form of ribbed jaw, the plate-like sections being actually divided by delicate longitudinal ribs. It is to be understood that the jaw is not in separate pieces, as in *Orthalicus* and *Liguus* (see Ibid, p. 168). Our figure of the jaw of *Helix turbiniformis*, Pfr. (Ibid, pl. ii, fig. 2), gives the same type of jaw, though differing in form. That of *Succinea ? appendiculata* (Ibid, X, pl. ix, fig. 2) is still nearer the jaw we are considering.

The lingual membrane is entirely different from what we had supposed from our interpretation of Shuttleworth's description. We recognize no resemblance to that of *Zonites* and *Vitrina*, but rather (in arrangement and shape of teeth and position of cusp) to that figured by us of *Orthalicus zebra* and *undatus* (Amer. Jour. of Conch. 1870, pl. ix, figs. 2, 6, 10, 12,) and *Liguus fasciatus* drawn by Leidy, (Terr. Moll. U. S. II, 270). From these, however, it differs in the development of its cusp, which shares the trifid character, and nearly resembles that of *Helix muscarum* (Am. Jour. Conch. l. c. fig. 4).

Lingual membrane long and broad, composed of numerous rows of teeth arranged *en chevron*. Centrals very long, narrow, obtuse above, incurved at sides, obtusely rounded and expanded at base near which is a short, gouge-shaped, expanded cusp, whose lower edge is bluntly tridentate. Laterals same as centrals in shape, but a little larger, and unsymmetrical from the disproportionate expansion of the outer denticle of the cusp. Marginals same as laterals, but more slender, with more developed and graceful teeth, of which the median is pointed, often bifid. There is much variety in the shape and denticulation of the cusps. The middle denticle is always the smallest.

We find no distinct marginal teeth of the aculeate type noticed by Shuttleworth, but believe he was misled by seeing these teeth in exact profile, when they have somewhat that form as shown in our figure 6. Seen from above,





however, the same teeth retain their subquadrate form, figure 7. Both jaw and lingual membrane, therefore, prove that the genus belongs to the *Helicinae* of our proposed arrangement of Pulmonata (see Ann. Lyc. N. H. of N. Y., l. c. 165), or to the *Helicea* of von Martens. (Die Heliceen, ed. 2.)

By its jaw, *Gæotis* calls to our mind the genus *Amphibulina* (see pl. xi, fig. 8), as well as the shell known as *Succinea? appendiculata* Pfr., whose generic position we have left in doubt (Ibid, X, pl. ix, fig. 2), and many species of *Bulimulus*. We have above shown the resemblance of its lingual dentition to that of *Orthalicus* and *Liguus*, as well as of *Helix muscarum*. It also forcibly reminds one of some of the features of the dentition of *Triboniophorus*.

Our figure 5, plate xi, gives the central and adjacent lateral teeth: fig. 6 an extreme marginal in profile, on a different scale of enlargement: fig. 7 a marginal seen as in fig. 6: fig. 1 the largest fragment saved of the jaw.

XXII. — *Note on a curious form of Lingual Dentition in Physa.*

BY THOS. BLAND AND W. G. BINNEY.

Read January 6, 1873.

WE have received from Governor Rawson specimens in alcohol of a shell apparently belonging to the genus *Physa*, collected at Point à Pitre by M. Schramm. On examining its jaw and lingual dentition, we find both different from what is usual in that genus. The jaw is not at all chevron-shaped,* but is simply slightly arcuate, long, low, ends attenuated. The lingual membrane wants entirely the broad transverse rows of comb-like teeth arranged *en chevron*

* See figure of jaw of *Physa* in Land and Fresh Water Shells of North America, II p. 75, fig. 123.

which are characteristic of *Physa*.^{*} On the other hand, the lingual membrane is long and narrow, with almost horizontal rows of teeth. The centrals are narrow, somewhat expanded at the base, at apex recurved into a slightly produced quinquedentate cusp, the central denticle the largest. The laterals are quadrate, the whole apex recurved into a broad cusp produced almost to the base of the tooth, with one large, inner, stout, pointed denticle which bears on its inner side another small pointed denticle, and two, small, irregular, sharp, side denticles. The marginals are but modifications of the laterals, wider than high, with one bluntly bifid inner, and several small, blunt, irregular side denticles.

The centrals and laterals are like those of *Limnæa*† rather than of *Physa*, the marginals more like those of *Planorbis*‡ but much more quadrate.

In our figure 2 of plate xi, we give one central and several lateral teeth, in fig. 3 one marginal: fig. 4 represents the jaw.

A view of the shell is also given in fig. 9.

We have not been able to determine this species of *Physa*, represented by M. Schramm to be very rare. In some respects it appears to be allied to *P. striata* D'Orb. (Cuba I. 192, Tab. xiii, figs. 14-16), received by that author from M. Ferdinand de Candé, but whether from Martinique or Cuba was not positively known.

EXPLANATION OF PLATE XI.

- Fig. 1. A portion of jaw of *Gæotis* (p. 253.)
2. *Physa* —? (See p. 255.) One central tooth and two laterals from the lingual membrane.
3. The same as 2. One marginal tooth.
4. The same. The jaw.

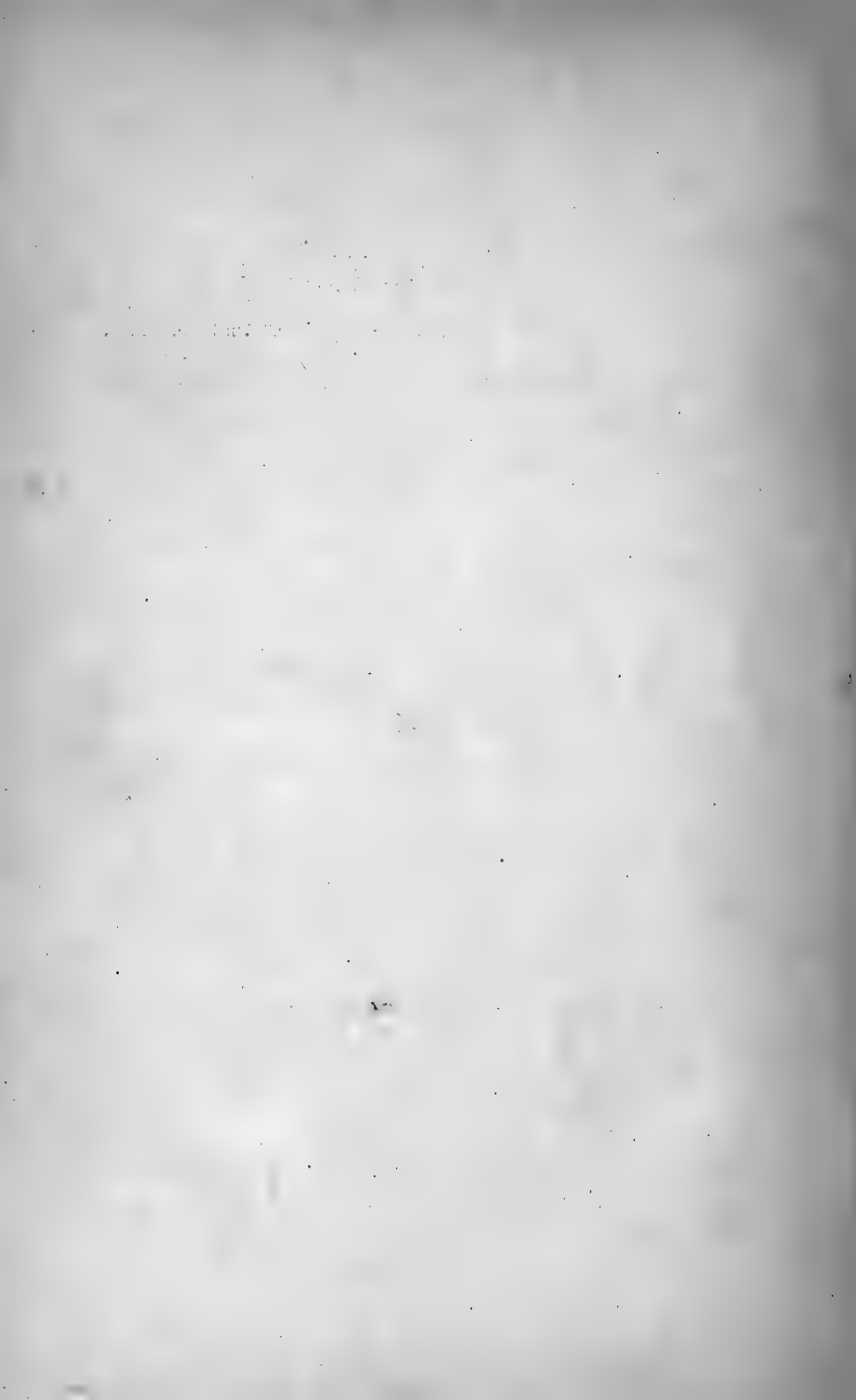
^{*} See Ibid, p. 81, fig. 138: p. 82, fig. 141. *Physa ampullacea*, Gld. from Colorado Territory, lately collected by Dr. E. Palmer, has the same type of lingual. Dall has detected a more simple form of tooth alternating with the comb-like laterals of *Physa*. See his exhaustive review of *Limnæidæ* etc., in Ann. of Lyc. N. H. of N. Y., IX, 333, for valuable information on the dentition of the fresh water Pulmonates.

†See our figures in the Amer. Jour. of Conch., 1871, pl. xii.

‡See our figure in Ann. of Lyc. N. H. of N. Y., IX, p. 292.

- Fig. 5. Lingual dentition of *Gæotis*. One central tooth with adjacent laterals.
6. Same as last, but more enlarged. An extreme marginal tooth in profile.
7. Same as 5. An extreme marginal tooth.
8. *Amphibulima patula* (see p. 225.) The jaw folded as it appears on the microscope slide, the position taken from its extreme tenuity.
9. *Physa* sp. indet. Shell. Jaw and Lingual dentition. Figs. 2-4.

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Vol. 10, Nos. 10-11, March-June, 1873.]

XXVII.—On *Prophysaon*, a new *Pulmonate Mollusk*, on
Ariolimax, on *Helix lychnuchus* and other species.

BY THOMAS BLAND AND W. G. BINNEY.

Read April 28, 1873.

Description of Prophysaon, a new Genus of Pulmonate Mollusk.

ANIMAL limaciforme, postice acuminatum. Pallium antice positum, parvum, obtusum, marginibus anterioribus liberis, testam simplicem, haud spiralem includens. Margo infera animalis sulco longitudinali supra pedem posito instructa. Discus distinctus gressorius nullus. Apertura respiratoria et analis ad marginem dextram pallii paululum anteriorem positæ. Apertura genitalis ad latus dextrum, pone et infra tentaculum oculigerum. Porus mucosus caudalis nullus.

Testa interna longa, subhexagonalis.

Maxilla leviter arcuata, costis numerosis validis (in specie unica circa xv), confertis munita; marginibus denticulatis.

Lamina lingualis ut in *Helice* constituta. Dentes medianæ tricuspidatæ, laterales bicuspidatæ, marginales quadratæ, irregulariter cuspidatæ.

Habitat in Oregon et in California. Specimina plurima collegit H. Hemphill de Astoria usque ad San Francisco.

Genus *Limaci*, *Arioni* et *Ariolimaci* affine, sed facile distinguendum. *Limaci* affine est testa interna, et positione aperturæ genitalis; sed differt maxilla costata, dentibus lingualibus marginalibus subquadratis, et positione aperturæ respirationis. *Arioni* simile est genus maxilla costata, dentibus lingualibus marginalibus et positione aperturæ respiratoriæ; sed differt testa interna, positione aperturæ genitalis, et poro mucoso carente. *Ariolimaci* affine est maxilla costata, dentibus marginalibus quadratis lingualibus, et testa interna; sed differt positione aperturarum, respiratoriæ et genitalis, et poro mucoso carente. De omnibus generibus supra comparatis differt etiam nostrum genus carente disco gressorio distincto.

De genere Hibernico *Geomalaco* differt carentibus poro mucoso caudali, disco distincto gressorio, et positione pallii et aperturæ respiratoriæ (in *Geomalaco* valde anteriore); affine est testa interna, dentibus quadratis marginalibus lingualibus. Maxilla *Geomalaci* (vide infra, p. 309).

Ab ceteris generibus Americanis sat distinctum est.

Animal (see pl. xiii, fig. 8) limaciform, attenuated behind. Mantle anterior, small, obtuse before and behind, its margins free as far back as the cleft for the respiratory orifice, enclosing a simple, not spiral, subhexagonal shell, which is longer

than wide. A longitudinal line around the animal just above the edge of foot. No distinct locomotive disk to foot, but crowded, oblique furrows running from centre to edge. Respiratory and anal orifices on the right margin of mantle, slightly in advance of its centre, with the usual cleft to the edge. Genital orifice behind and below, but quite near to, the right eye-peduncle. No caudal mucus pore.

Jaw slightly arcuate, ends blunt, but little attenuated. Anterior surface with numerous (about fifteen in the only known species) crowded, stout ribs, which denticulate either margin (see pl. xiii, fig. 4).

Lingual membrane (pl. xiii, fig. 7) as usual in the genus *Helix*. Central teeth tricuspid. Laterals bicuspid. Marginals quadrate, irregularly cuspid, the inner cusps, as usual, longest.

Found in Oregon and California. Mr. Henry Hemphill has collected specimens from Astoria to San Francisco Bay.

This genus agrees with *Limax* by having an internal shell, and by the position of the genital orifice. It differs by its ribbed jaw, by the subquadrate marginal teeth of the lingual membrane, and by the anterior position of its respiratory orifice. The genus is allied to *Arion* by its ribbed jaw, its quadrate marginal teeth of the lingual membrane, and by the anterior position of its respiratory orifice; it differs in having an internal shell, in the position of its generative orifice and by the want of a caudal mucus pore. The genus is also allied to *Ariolimax* in having a ribbed jaw, quadrate marginal teeth to its lingual membrane and an internal shell; it differs in the position of both genital and respiratory orifices, and by the want of a caudal mucus pore. The absence of a distinct locomotive disk to the foot distinguishes our genus also from *Arion*, *Limax* and *Ariolimax*. It is not readily confounded with any other known American genus. The Irish genus *Geomalacus* is somewhat allied, having an anterior respiratory orifice and an internal shell, and being said by Gray to have crowded, quadrate teeth as

in *Helix*, from which we presume the marginals are quadrate, not aculeate. *Geomalacus*, however, differs from *Prophysaon* in having an extremely anterior mantle and orifice of respiration close behind the right tentacle. It also has a locomotive disk and caudal mucus pore. It is described below, p. 309.

***Prophysaon Hemphilli*. n. s.**

From specimens preserved in alcohol we can draw the following description only. Body blunt anteriorly, attenuated posteriorly, rounded and high on the back. Mantle granulated, whitish with a circular ring of smoke color above the respiratory orifice. Body obliquely reticulated with bluish lines, the reticulations larger (about twelve) below each side of the mantle, more numerous and smaller on the posterior extremity of the body. These reticulations are subdivided by irregularly disposed, rounded tuberosities, with colorless interstices. Above the foot, from the longitudinal line running around the animal to the edge of the foot, are perpendicular lines or furrows, also bluish in color. The foot has crowded wrinkles, running obliquely backwards from its centre to its margins. Length of an alcoholic specimen 40 mill.

Astoria, Oregon: Oakland and Mendocino Co., California (Mr. Henry Hemphill).

The internal shell (pl. xiii, fig. 2) differs in thickness, but is always well marked, sometimes suboval, sometimes subhexagonal, always longer than wide.

The jaw and lingual membrane have been described above.

The genitalia* are figured on pl. xiii, fig. 6. The testicle is composed of black aciniform cœca; it is almost completely buried in the upper lobes of the liver, the epididymis completely so, lying on the floor of the cavity formed by the spiral winding of the upper lobes. It appears to pass through one of the lower lobes to join the oviduct, before reaching which it is greatly convoluted. The accessory gland of the epididymis appears to be composed of several aciniform cœca of unequal size. The

*I alone am responsible for the descriptions of the anatomy.—W. G. B.

prostate gland is large. The vas deferens is extremely long, ten times as long as the penis, and equals the length of the whole genital system. It is attached to the side of the vagina quite to the penis, where it becomes free, and is spirally wound. It is largest about half-way from the vagina to the apex of the penis. It enters the penis at the centre of its truncated apex. The penis is very short and stout, barrel shaped, of equal breadth throughout. It has no retractor muscle. The cloaca is very short. On the vagina, just above the penis, appears on some specimens an extremely small, sac-like organ, not figured in our plate, as we are not entirely satisfied as to its presence. It is perhaps a dart sac, or a prostate. The ovary has the usual tongue-shaped form. The oviduct is not much convoluted. The vagina is long, and extremely broad, several times convoluted. The genital bladder is oval, small, with a short, stout duct entering the vagina at its upper extremity, by the side of the terminus of the oviduct.

This peculiarly stout, barrel shaped penis and broad vagina were constant in eight specimens examined, all from Astoria. In several other specimens from Mendocino County, easily detected exteriorly by a more slender, tapering body, and smaller, more rounded mantle, the penis was found more elongated, the vagina less broad, the genital bladder larger, with a more delicate duct. In these specimens, also, the testicle was very much larger and was not concealed in the liver, but only slightly entangled in it at one point, against which it lay. The epididymis in these specimens was also free from the liver. The genitalia of this form differ enough from those of the Astoria specimens to warrant our belief in the existence of a second species of *Prophysaon*. We have therefore figured, also (fig. 5), the genital system of the Mendocino County specimens. The question of specific identity must be settled by those who can study living specimens. The digestive system of the same form is figured on pl. xiii, fig. 3. It quite resembles that of *Arion hortensis* as figured by Leidy in *Terrestrial Mollusks*, Vol. I. It is much more simple than that of *Ariolimax*. The salivary glands are very broad and very arborescent, and form a broad collar around the œsophagus and commencement of the stomach. The last named organ is very broad.

Before deciding that this slug is new to science we compared it with the descriptions of *Arion foliolatus*, Gould (Terr. Moll. U. S., II, 30, pl. lxvi, fig. 2) and *Arion? Andersonii*, J. G. Cooper (Proc. Phila. A. N. S., 1872, 148, pl. iii, fig. F, 1-5). Our species cannot be identical with the former, which is described as an *Arion*, with "a conspicuous pit, which probably was occupied by a mucus gland" at the truncated tip of the tail. The areolæ formed by the reticulating lines of *A. foliolatus* are said to have their surfaces indented by leaf-like markings, no doubt the same as the granulations between the reticulations of *Prophysaon*. In our genus, however, the granulations seem less regularly arranged. The figure of *Arion foliolatus** shows, also, a larger mantle, which leaves a much smaller space between its lower margin and the longitudinal furrow above the foot, than does the mantle in our species.

At first sight it seemed as if our species might be identical with *Arion? Andersonii*, but that species is described and figured with a distinct locomotive disk, with the respiratory orifice perceptibly anterior only when the animal is fully extended, with a jaw having 20-30 ribs, with a minute caudal mucus pore and with the generative orifice half-way between the tentacle and the mantle, all of which does not apply to *Prophysaon Hemphilli*.

We deem it necessary, therefore, to find a specific as well as generic name for our slug, and take pleasure in adopting that of Mr. Henry Hemphill, who has given us so much assistance in our studies of the land shells of the Pacific Coast.

On the Generic Characters of **Ariolimax**.

Having received from Mr. J. G. Anthony, of the Cambridge Museum of Comparative Zoology, a specimen of the true *Ariolimax*, probably the *A. Californicus*, we are en-

*Fig. b of the Ex. Ex., shows the respiratory orifice behind the centre of the mantle edge.

abled to give a more full description of the genus than that contained in our Land and Fresh Water Shells of North America.

ARIOLIMAX. Animal limaciforme, postice acuminatum. Pallium antice situm, parvum, obtusum, marginibus liberis, testam simplicem haud spiralem, solidam includens. Margo infera animalis sulco longitudinali supra pedem posito munita. Discus gressorius distinctus. Apertura respiratoria ad marginem dextram pallii in parte posteriore posita; apertura analis vicina, sed postice et infra posita. Apertura genitalis ad latus dextrum corporis, sub parte anteriore libera pallii posita (in *A. Californico* duobus orificiis distinctis munita). Porus mucosus caudalis triangularis erectus supra apicem pedis.

Maxilla leviter arcuata, costis numerosis (viii-xx), validis, confertis munita; marginibus denticulatis.

Lamina lingualis ut in *Helice* constituta. Dentes medianæ tricuspidatæ; laterales bicuspidatæ; marginales quadratæ, irregulariter cuspidatæ, cuspe interna producta, externa sæpissime subobsoleta.

Habitat in regionibus Pacificis Statuorum Unitorum, inter Oceanum et montes "Cascade" et "Sierra Nevada" dictas, de lat. 34° usque ad 49°.

Genus a cl. Mörch primo descriptum, Mal. Blatt. VI, 110, Oct., 1859; postquam a W. G. Binney Amer. Journ. Conch. I, 48, pl. vi, fig. 11-13, 1865; deinde, W. G. Binney et T. Bland, L. and F. W. Shells N. A., I, 278, p. 496-8, 1869. Ceteris auctoribus ad *Limacem* refertur: Gould in Terr. Moll. U. S. II, 1851; W. G. Binney ante, Terr. Moll. IV, 1859; Tryon, Am. Journ. Conch., III, 315, 1868.

Genus *Limaci*, *Arioni* et *Prophysaonti* affine, sed facile distinguendum. *Limaci* affine est testa interna, positione aperturæ respiratoriæ, et disco gressorio distincto; sed differt poro mucoso caudali, maxilla costata, dentibus marginalibus quadratis laminæ lingualis, et positione aperturæ genitalis. *Arioni* simile poro mucoso caudali, disco gressorio distincto, maxilla costata, lamina linguali, positione aperturæ genitalis; sed differt positione aperturæ respiratoriæ, et testa interna. *Prophysaonti* simile testa interna, maxilla costata, lamina linguali; sed differt positione aperturarum, respiratoriæ et genitalis, disco gressorio distincto, et poro mucoso caudali.

Ab ceteris generibus Americanis limaciformibus aut sublimaciformibus, *Veronicella*, *Binneia*, *Hemphillia*, *Tebennophoro* et *Pallifera* sat distinctum est.

Species adhuc notæ:—

Ariolimax Columbianus, GOULD (*Limax*), Terr. Moll. U. S., II, 43, pl. lxvi, fig. 1. Conf. BINNEY et BLAND, L. and F. W. Shells N. A., I, 279.

Ariolimax Californicus, J. G. COOPER, Proc. Acad. Nat. Sci., Phila., 1872, p. 146, pl. iii, fig. D, 1-3.

Ariolimax niger, J. G. COOPER, l. c., 147, pl. iii, fig. E, 1-4.

Animal limaciform, blunt in front, pointed behind. Mantle anterior, small, bluntly truncated before and behind, free around its edges, containing a well defined, solid, testaceous plate. A longitudinal furrow along the sides above the foot. A distinct locomotive disk. Respiratory orifice at the posterior third of the mantle, with a cleft to its right margin. Anal orifice contiguous to the last, slightly below and behind it. Orifices of generation on the right of the body, below the anterior, free part of the mantle, distinct but contiguous (in *A. californicus*, certainly), that of the male organ anterior. Tail furnished with a perpendicular, triangular mucus pore, with a horizontal mucus slit to the end of the tail.

Testaceous plate flat, thick, calcareous, simple, not spiral; longer than wide, hexagonal.

Jaw (see L. and F. W. Shells, p. 278, fig. 497) slightly arcuate, with numerous (from eight to twenty in the several species) stout, crowded ribs, denticulating either margin.

Lingual membrane (see L. and F. W. Shells I, p. 279, fig. 498) as usual in *Helix*. Teeth in numerous horizontal rows; centrals tricuspid; laterals bicuspid; marginals (see our plate xiii, fig. 1) quadrate, irregularly denticulated, the inner cusp the largest.*

Inhabits the Pacific Coast of the United States, at least from lat. 34° to 49°, apparently not eastward of the Sierra Nevada and Cascade Ranges.

The species on which the genus was founded has been known for many years as a *Limax* (see Gould in Terr. Moll. U. S., II, III and Ex. Ex. Mollusca, where an additional figure is given), but it was not until 1859 that Mörch (Mal. Blatt. VI, 110) recognized it to be distinct from *Limax* and proposed a generic name, *Ariolimax*. In 1865, W. G. Binney (Amer. Journ. Conch. I, p. 48, pl. vi, figs. 11-13) gave a more detailed generic description, adding figures of

*In only one instance have we seen marginal teeth as in our figure. In all other specimens examined the marginals are as figured in L. and F. W. Shells, *l. c.*, with one long cusp and one obsolete side cusp.

jaw and lingual dentition. These were also given in our Land and Fresh Water Shells N. A., I, p. 278, figs. 496-8 (1869). As late as 1868 the species is still retained in *Limax* by Tryon (Amer. Journ. Conch. III, 315), who gives a copy of one of Gould's figures from the Terrestrial Mollusks.

The genus has affinities with, but is readily distinguished from, *Limax*, *Arion* and *Prophysaon*. It agrees with *Limax* in having an internal shelly plate, in the position of its respiratory orifice and its distinct locomotive disk; but it differs in having a caudal mucus pore, a ribbed jaw, quadrate (not aculeate) marginal teeth on the lingual membrane, and in the position of its genital orifice. With *Arion* it agrees in having a mucus pore, a distinct locomotive disk, a ribbed jaw, in its lingual membrane, and position of the genital orifice; but it differs in the position of its respiratory orifice and its internal shell. With *Prophysaon* it agrees in having an internal shell, a ribbed jaw, in its lingual membrane; but differs in the position of the genital and respiratory orifices, in its distinct locomotive disk and caudal mucus pore.

From the other sluglike, or semi-sluglike American genera, *Tebennophorus*, *Pallifera*, *Binneia*, *Hemphillia*, *Veronicella*, it is most readily distinguished.

Several species are known:—

Ariolimax Columbianus, GOULD (*Limax*) see L. and F. W. Shells, I, 279, for its synonymy, to which must be added *Limax Columbianus*, Tryon, Amer. Journ. Conch., III, 315, pl. xvi, fig. 1, copy. (1868.) This is found in Washington Territory and Oregon, confined, according to Dr. Cooper, to the west of the Cascades.

Ariolimax Californicus, J. G. COOPER, Proc. Phila. Acad. Nat. Sci., 1872, p. 146, pl. iii, fig. D, 1-3. California, in the Coast Range, once only in the Sierra Nevada in lat. 39°.

Ariolimax niger, J. G. COOPER, *l. c.* 149, pl. iii, fig. E, 1-4.

San Francisco Bay. An examination of the original specimens belonging to the State collection of California convinced us of this being a distinct species. The anatomy, especially the genitalia, of these species varies greatly, as we hope to show in a future paper.

On the Generic Position of Helix lychnuchus, Müll.

Prominent among the group of Helices known as *Dentelaria* is *Helix lychnuchus*, Müller, a species well known from its characteristic shell. Though its specific identity is unquestioned, it has been less fortunate with respect to generic position. From an examination of the generative organs and jaw, this species was referred by M. de St. Simon (*Journ. de Conch.* III, p. 227, Aug., 1853) to the genus *Zonites*. So positively was this determination made that it has been accepted by subsequent authors, either absolutely or to a degree sufficient to throw doubt upon the species being a true *Helix*. Thus in the second edition of Albers' "Die Heliceen," p. 79, there is a paragraph fixing the place it would hold as a distinct genus among the *Vitrinea*, should St. Simon's observations be confirmed; and quite recently we find it singled out by Messrs. Fischer and Crosse (*Moll. Mex. et Guat.*, p. 205) as an instance of the shell of a terrestrial mollusk being unreliable in indicating generic position.

Early in our studies of the classification of land shells, we were inclined to doubt the correctness of St. Simon's decision. On consulting his paper (p. 234) we noticed that he placed *Helix lychnuchus* in *Zonites* simply because he accepted Moquin-Tandon's decision that *Zonites* is generically distinct from *Helix*, in having (1) a jaw without ribs or marginal denticulations and with a median rostriform projection to its cutting edge; and (2) by the absence of dart, dart sac and multifid vesicles in the generative system. We had satisfied ourselves that this distinction does not exist,

and even at the time of writing his article, St. Simon might have learned from the first volume of the "Terrestrial Mollusks of the United States" that many *Helices* have the most simple form of genitalia, while several true *Zonites* have the dart, dart sac, and some form of multifid vesicle. As to the presence or absence of ribs upon the jaw, or a median projection to its cutting edge, we were well aware from our own observations that those characters were valueless for the purposes of distinguishing *Zonites* from *Helix*. Our doubts as to the correctness of the reference by St. Simon of *Helix lychnuchus* to *Zonites*, were confirmed on finding the allied species* of the subgenus *Dentellaria*, *H. orbiculata*, Fer., *Isabella*, Fer., *dentiens*, Fer., and *perplexa*, Fer., to be true *Helices*. All of those species have the quadrate marginal teeth which characterize the genus *Helix*, while, as is well known, the genus *Zonites* is characterized by aculeate marginal teeth. Moreover we did not observe in any of the above species the marginal furrows above the edge of the foot, the distinct locomotive disk, or the caudal mucus pore prevailing in *Zonites*.

Confident, therefore, that the species would prove a true *Helix*, we have for some time endeavored to obtain specimens of the animal, but have only recently succeeded in so doing. Through the kindness of Mr. A. Schramm we are in receipt of several specimens preserved in glycerine, from Guadeloupe. On examination of these specimens we find, from both external and internal characters of the animal, that our surmises are corroborated in every particular. The species, therefore, animal as well as shell considered, must remain in *Helix*, as now accepted by von Martens and most authors.

Helix lychnuchus. Lingual membrane (pl. xiv, figs. 7, 8), long and broad. Teeth arranged in numerous horizontal rows. Centrals tricuspid, laterals bicuspid, the side cusps of each being subobsolete; marginals quadrate,

* Two more of this subgenus are described below in this paper, p. 305, 306.

low, wide, the upper margin reflected along its whole length and produced into two oblique, broad, bluntly rounded cusps, the inner one bluntly bifid.

Jaw (see pl. xiv, fig. 5) arched, high, ends blunt, scarcely attenuated; concave margin with a broad, blunt, median projection. Upper margin showing slightly the ends of subobsolete ribs, whose presence is scarcely discernible on the anterior surface. Strong perpendicular striæ, and stout transverse lines of reinforcement.

We have also examined the genital system and find it apparently as described by M. St. Simon (*l.c.*). Its characteristic is the long, flagellate penis, and long, large duct to the genital bladder. (See pl. xiv, fig. 6.) The external orifice of the generative organs seems, as stated by M. St. Simon, to be under the mantle, not far in advance, on the side of the neck, behind the right tentacle. See our remarks on the value of this character in *Ann. N. Y. Lyc. Nat. Hist.*, X, p. 165.

It is interesting to state in this connection, that we have already rescued from a similar misapprehension one species of the genus *Leucochroa* (*L. Boissieri*, see *Ann. of N. Y. Lyc. Nat. Hist.*, X, p. 220), a genus separated from *Helix* on the same grounds as *Helix lychnuchus* was referred to *Zonites*. We cannot refrain from believing that all the species referred to *Leucochroa*, including *L. candidissima*, will be proved to have quadrate marginal teeth.

The species allied to *Helix lychnuchus*, also referred to *Dentellaria*, *H. Isabella* and *H. dentiens*, have decidedly costate jaws; *H. orbiculata* and *perplexa* have only some approach to ribs on their jaws; the last mentioned has a broad median projection. All of them have on their lingual membranes marginal teeth of the type described above in *Helix lychnuchus*.*

*The habitat given of this species, in Albers, 2d ed. (Porto Rico), is unquestionably erroneous. It is by no means uncommon in Guadeloupe, and Pfeiffer refers it also to Martinique, but we have not seen any authentic specimen from that island.

On the Specific Distinction of ***Helix Columbiana***, Lea, and
Helix germana, Gould.

We have hitherto found difficulty in separating certain forms of *Helix Columbiana*, Lea, and *Helix germana*, Gould, but have recently received, through the kindness of Mr. Henry Hemphill, specimens of both species, preserved in alcohol, from several distinct localities. An examination of their soft parts has proved that in the jaw and genital system there exists a specific difference readily detected. This difference appears to be constant, as we have observed it in one specimen, with parietal lamina and quite depressed, of *Helix Columbiana*, from San Leandro, California, and three from another locality. In *Helix germana* we also have found the characters constant, having examined four specimens, one from Astoria, the other three from a separate locality.

In the jaw, the distinction is in its general outline and in the size and frequency of the ribs on the anterior surface. In *H. germana* the jaw is slightly arcuate (see pl. xiv, fig. 4); the ribs are about eleven in number, broad, crowded, with narrow interstices only, generally resembling the jaw found in the subgenus *Stenotrema* (see our L. and F. W. Shells N. A., Part I). In *Helix Columbiana* (pl. xiv, fig. 2) the jaw is more arched, the ribs are less numerous, about eight, narrower, much more separated, and more decidedly produced on either margin, as usual in *Mesodon*.

In the genitalia the difference lies in the genital bladder. This organ in *Helix Columbiana* is clavate, short, with a short, stout duct (fig. 1, *a*) but in *Helix germana* (fig. 3, *a*) it is globular and has a long, narrow duct.

In both species the retractor muscle of the penis is attached

NOTE. In L. and F. W. Shells N. A., Part I, 120, we included *H. germana* in *Stenotrema*, but it has not the internal transverse tubercle characteristic of that subgenus. In the foregoing remarks we have shown that *H. germana* differs specifically from *H. Columbiana*, but consider that both species belong to *Mesodon* rather than the latter to *Stenotrema*.

to the vas deferens, a short distance before the latter organ enters the penis, which it does at the apex of the penis sac.

Macrocyclus Baudoni, Petit.

We have already described the lingual membrane of this species. (See Am. Journ. Conch., VII, p. 175.) Recently we have received a Guadeloupe specimen (not adult), from Mr. Schramm. On extracting the lingual membrane we found attached to it a most delicate, transparent, colorless jaw, arched, with pointed ends, median projection to cutting edge and smooth anterior surface.

This, added to the lingual dentition, places the species in *Macrocyclus*.

Bulimulus multifasciatus, Lam. (*Liostracus*.)

Antigua. Governor Rawson.

Jaw long, very low, slightly arcuate; ends attenuated, pointed; extremely thin, transparent; divided by numerous delicate ribs into over thirty plates of the form common to *Bulimulus*, *Cylindrella*, etc., the upper median plates triangular.

Lingual membrane broad. Teeth in numerous waving rows, of the type we have described and figured in *Bulimulus laticinctus*. (Ann. Lyc. Nat. Hist., N. Y., X, p. 81, pl. ii, fig. 1, 5.) The centrals are distinctly trifid.

Bulimulus alternans, Beck. (*Liostracus*.)

Islands in the Bay of Panama. Mr. McNiel.

Jaw long, low, slightly arcuate, extremely thin and transparent; divided by numerous delicate ribs in about fifty-two plates of the type common in *Bulimulus*, *Cylindrella*, etc.

Lingual membrane as in the preceding species.

Helix pachygastra, Gray. (*Dentellaria*.)

Guadeloupe. Mr. Schramm.

Jaw stout, slightly arcuate, ends blunt; anterior surface with decided ribs, denticulating either margin, about seven, irregularly disposed; both ends free from ribs.

Lingual membrane as usual in the subgenus; see above, p. 303 and plate xiv, figs. 7, 8, for those of *Helix lychnuchus*.

Helix Josephinae, Fér. (*Dentellaria*.)

Guadeloupe. Mr. Schramm.

Jaw stout, ribless; so strongly arched as to be quite horse-shoe shaped. Ends bluntly rounded. A decided median projection to cutting edge, marked with strong vertical striæ.

Lingual membrane as in preceding.

Helix invalida, Adams. (*Pleurodonta*.)

Jamaica. Mr. Henry Vendryes.

Jaw not examined.

Lingual membrane as in the preceding. The centrals and laterals quite short and stout.

Punctum minutissimum, Lea.

This species was described as *Helix minutissima* by Mr. Isaac Lea, in 1841. Its proper generic position was unknown, however, prior to 1864, when Professor Edward S. Morse, published figures of the jaw and lingual dentition (*Journ. Portland Soc.*, I, p. 27, fig. 70, pl. viii, fig. 71).

He thus described the jaw:—

“The buccal plate (fig. 70) is made up of sixteen long, slender, corneous laminæ, recurved at their cutting edges, these plates partially lapping over each other.”

Morse remarked on the similarity between Lea's species and *H. pygmæa* Drap., of Europe, adding, “and it seems singular that it has never been referred to that species,” but after examination of the jaw of the latter, as figured by Moquin-Tandon, Morse considered it generically distinct.

The following is Moquin-Tandon's description of the jaw of *H. pygmæa* (*Moll. de France*, II, p. 103, pl. x, fig. 2, 1855).

“*Mâchoire* large de 0^{mm}.25, peu arquée, mince, à peine cornée, transparente, assez facile à étudier à cause de la transparence des téguments; extrémités amincies; partie moyenne du bord libre un peu surbaissée; côtes verticales nombreuses, fines, serrées; crénelures très petites.”

In W. G. Binney's Synopsis (Smith. Inst. Coll., p. 4, Dec., 1863) *Hyalina* (*Conulus*) *minutissima*, Lea, is enumerated, and Tryon (Amer. Jour. Conch., II, p. 257, 1866) placed the species in *Conulus*, while quoting the particulars given by Morse, of the jaw.

In 1868, Lindström (Gotlands Nut. Moll., taf. iii, f. 12) published figures, but without description, of the jaw of *H. pygmæa*. On comparison of this with Morse's figure of *minutissima*, the identity of the two species could scarcely be inferred.

In our Land and Fresh-water Shells (Part I, p. 221, 1869) we adopt *Punctum*, Morse, as the generic name of Lea's species, treating that genus as belonging to *Orthalicinæ*, by reason of the structure of the jaw.

W. G. Binney (Invert. Mass. 2d ed., p. 403, fig. 665, 1870) has *Hyalina minutissima* as occurring in Massachusetts, adding in a note "the character of the jaw would place the species in the subfamily *Orthalicinæ*, as a distinct genus for which Morse's name *Punctum* might be retained, otherwise the species would be placed in *Hyalina*."

Mr. J. Gwyn Jeffreys (Ann. & Mag. Nat. Hist., Oct., 1872) refers to *Hyalina minutissima* as being identical with *Helix pygmæa*, Drap.

Dr. G. Schacko (Malak. Blatt., p. 178, 1872) has recently described both jaw and lingual teeth of *H. pygmæa*, showing that both have the same characters as ascribed by Morse to *Punctum minutissimum*.

The following is a translation of Schacko's description of the jaw of *H. pygmæa*:—

"The jaw consists of nineteen plates, which are grouped in the form of a horse-shoe. They lie together like the tiles of a roof, and partially cover one another. The plates are connected by a fine transparent membrane. The middle plate, which is the largest, and perfectly straight at the top, lies entirely alone, so that a space is visible between it and the two next side-plates. These are smaller and of the same length, while the top is slightly curved. The plates have the same form as regards their length, but the curve increases towards the end plates. The third

plate from the middle begins to cover the second, the fifth covers half of the fourth, and the succeeding plates always more, until the last covers two-thirds of the preceding one."

The formula of the lingual membrane is given by Schacko as being one hundred and fourteen rows of 19-1-19; by Morse of Lea's species, fifty-one rows of 13-1-13.

The centrals of *H. pygmæa* are said by Schacko to be tricuspid; the two side centrals so small, and scarcely recognizable, that they entirely disappeared in one specimen; the laterals bicuspid. He remarks that every tooth of the radula lies alone, so that even the cusps do not cover or disturb the basal surfaces of the overlying rows.

Schacko refers to the near alliance, in form of jaw especially, of *H. pygmæa* with *H. minutissima* of the genus *Punctum* of Morse.

Looking at the descriptions and figures of the jaws of *pygmæa* and *minutissima*, we notice, with striking general similarity of characters, some differences; on the other hand the lingual teeth of the two forms appear to be the same, and the shells without variation of specific value.

The facts regarding the distribution of *H. pygmæa*, which may be treated as one of the circumpolar species, favor the opinion, which we are disposed to adopt, that Lea's specific name must be placed in the synonymy of *Punctum pygmæum*.

The species known as *H. pygmæa*, Drap., has an extensive range in northern (Lapland, Denmark, etc.) and central Europe. The North American form occurs in California, also in Maine, Massachusetts, New York and Ohio, and has lately been discovered by Mr. Hugo W. Ericsson, in Bosque County, Texas.

***Geomalacus maculosus*, Allm.**

On p. 293 of this article we compared *Prophysaon* with the Irish genus *Geomalacus*, as far as known to us by pub-

lished descriptions.* Since then we have received through the kindness of Mr. Gwyn Jeffreys six specimens, preserved in spirit, of *Geomalacus maculosus*, Allm. This enables us to give the following description and figures.

Jaw (fig. A), high, stout, dark horn-colored, arched, ends but little attenuated, bluntly rounded; anterior surface with about twelve, broad, crowded ribs, of which four on the middle part of the jaw are stout, well developed, denticulating either margin, and produced below so as to give the appearance of a median projection to the cutting edge: the remainder of the ribs are unequally developed in the several specimens examined, being sometimes scarcely discernible; on one specimen is a median, transverse line of reinforcement, parallel to the margins of the jaw.

Lingual membrane long, not very broad. Teeth arranged in horizontal rows, of the form common to the *Helicinae*. Centrals (fig. B) tricuspid, laterals (Fig. B) bicuspid, the external cusps of each being subobsolete. Marginals (Fig. C) quadrate; with one long inner oblique, pointed cusp, and one outer, small, pointed cusp. Extreme marginals lower than wide, but retaining the same bicuspid character.

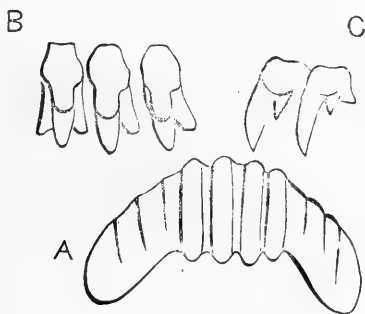


Fig. A gives an enlarged view of the jaw. B gives one central and two lateral teeth of the lingual membrane. C gives several marginals.

The genitalia are as usual in the limaciform *Helicinae*. The testicle is black, embedded in the upper lobe of the liver, connected by a long epididymis to the oviduct. The ovary is tongue shaped. The oviduct is convoluted. The genital bladder is small, round, with a long, delicate duct. The vas deferens is twice as long as the whole genital system, four

* Owing to our copy of *Nachrichtsbl. mal. Gesellsch.* being imperfect, the description of Heynemann I. p. 165-168, pl. i, fig. 1, is known to us only from the notice in the *Zoological Record*, VI, p. 565.

times as long as the penis sac, which it enters at its apex. This sac is cylindrical, stouter and longer than the vagina; the retractor muscle is inserted opposite the entrance of the vas deferens, beyond which point the sac is extended in a short delicate duct, which enters a large ovate organ, one-third the length of the penis sac. This organ is the peculiar characteristic of the species, present in all the six specimens examined. It no doubt is of the same use as the bulb-like termination sometimes found to the flagellum in other species, but is of extraordinary dimensions.

EXPLANATION OF PLATES XIII AND XIV.

The separate organs of the anatomical figures will readily be recognized, or may be compared with the figures in "Terrestrial Mollusks U. S.," I.

PLATE XIII.

Fig. 1. *Ariolimax niger*. The extreme marginal teeth. See p. 299, foot note.

Fig. 2. *Prophysaon Hemphilli*. The internal shell enlarged.

Fig. 3. The same. Digestive system. Same form as fig. 5.

Fig. 4. The same. The jaw greatly magnified.

Fig. 5. The same. The genitalia of the form referred to on p. 296. *a*, the genital bladder.

Fig. 6. The same. The genitalia of the typical form, still more enlarged.

Fig. 7. The same. Central, lateral and marginal teeth of the lingual membrane.

Fig. 8. The same. External view of a specimen contracted in spirits. Magnified.

PLATE XIV.

Fig. 1. *Helix Columbiana*, Lea. The genitalia. *a*, the genital bladder.

Fig. 2. The same. Jaw.

Fig. 3. *Helix germana*, Gld. The genitalia. *a*, the genital bladder.

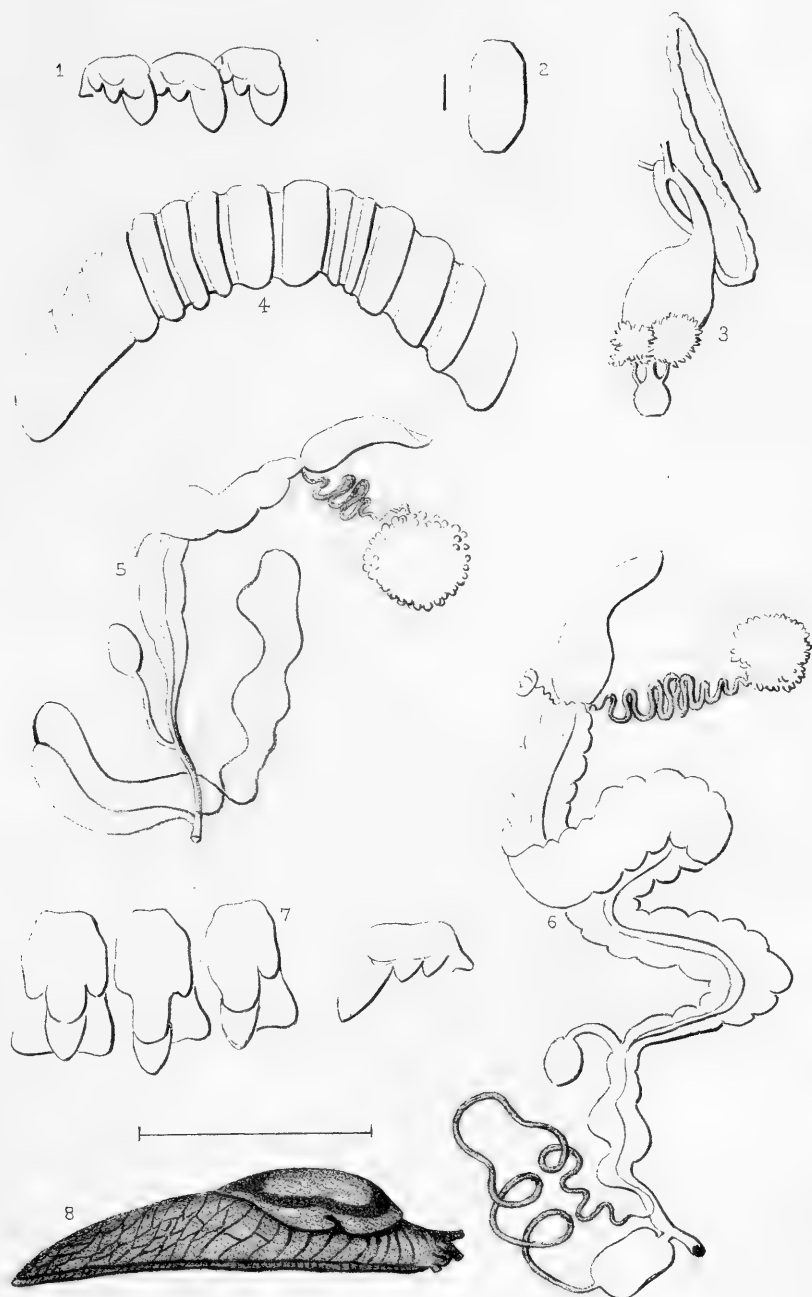
Fig. 4. The same. Jaw.

Fig. 5. *Helix lychnuchus*, Müll. Jaw.

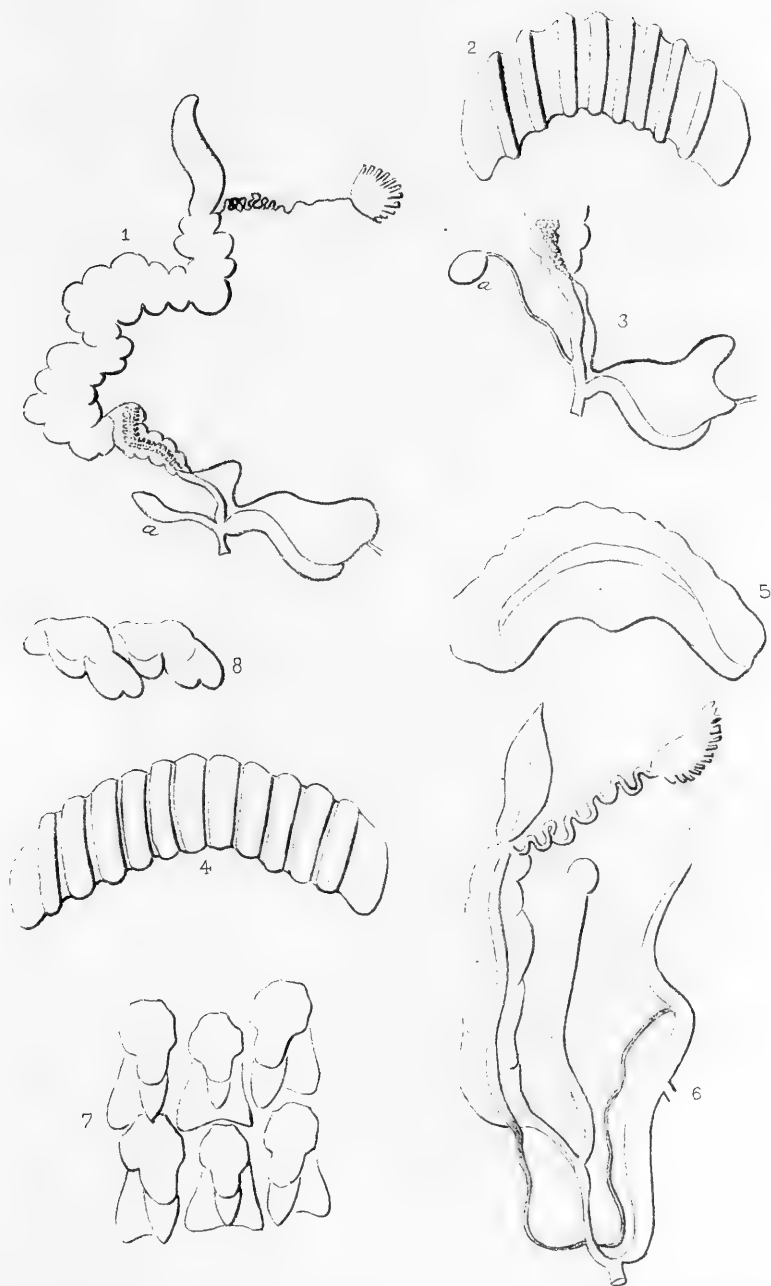
Fig. 6. The same. Genitalia. The accessory gland of the epididymis is not shown in the figure. It was broken off.

Fig. 7. The same. A group of central and lateral teeth of the lingual membrane.

Fig. 8. The same. Marginal teeth from the left of the median line of the lingual membrane.









XXX.—On the Lingual Dentition and Anatomy of *Achatinella* and other Pulmonata.

By THOMAS BLAND AND W. G. BINNEY.

Read October 6, 1873.

[Reprinted from the Annals of the Lyceum of Natural History, N. Y., Vol. x, Nov., 1873.]

IN the early part of the present year, 1873, Bland especially requested his friend, the Rev. John T. Gulick, who was about to visit the Sandwich Islands, to obtain and preserve in alcohol specimens of different forms of *Achatinella* with the animals, with a view to the examination of their dentition.*

It seemed probable from the differences in the shells, on which alone the subgenera of authors are founded, that variation would be discovered in the dentition, leading to a more satisfactory classification of the species.

Appreciating the value of the proposed examinations, Mr. Gulick, whose stay in the Sandwich Islands was very limited, forwarded to Bland from San Francisco, on his embarking for China, a number of specimens with a list, of which the subjoined is a copy.†

FROM WEST MAUI.

<i>Laminella picta</i> , Mghls.	Wailuku.	<i>Amastrea Mastersi</i> , Newc.	Wailuku.
<i>Auriculella jucunda</i> , Smith.	Wailuku.	<i>Leptachatina nitida</i> , Newc.	"
		" <i>grana</i> , Newc.	"

FROM EAST MAUI.

<i>Partulina plumbea</i> , Gk.	Makawao.	<i>Auriculella solidissima</i> , Smith.	Makawao.
" <i>eburnea</i> , Gk.	"		"
<i>Amastrea Mastersi</i> , Newc.	"		"

* At that time the only knowledge we had of the subject was contained in Heyne-mann's description and figure of the lingual membrane of *A. bulimoides* in Mal. Bl., 1869.

† The following extract from Mr. Gulick's letter is too interesting not to be quoted:

"I find that some of the most abundant species of twenty years ago have now become almost, if not quite, extinct. Some have not been found for many years, though repeated search has been made for them. This has occurred not only where the forests have been destroyed by cattle and by woodmen, but where the sunlight has been let into the close shades by the thinning out of the trees or by the increase of drought. In other places, the various forms of vegetable and animal blight have invaded the forests, proving fatal to the snails long before the trees are destroyed."

FROM OAHU.

<i>Achatinella livida</i> , Swn.	Kawailoa.	<i>Auriculella solida</i> , Gk.	Kawailoa.
<i>Amastra decorticata</i> , Gk.	"	<i>Bulimella tæniolata</i> , Pfr.	Waialae.
on the ground.		<i>Achatinella varia</i> , Gk.	"
<i>Amastra luctuosa</i> , Pfr.	Kawailoa,	<i>Apex pallida</i> , Nutt.	Makiki.
on the ground.		<i>Achatinella producta</i> , Rv.	Makiki.
<i>Amastra nigrolabris</i> , Smith.	Ka-	<i>Achatinella Johnsonii</i> , Newc.	Ma-
wailoa, on trees.		kiki.	
<i>Leptachatina dimidiata</i> , Pfr.	Ka-		
wailoa.			

The species so sent for examination by Mr. Gulick are in the following list placed in the subgenera adopted by von Martens in the second edition of "Die Heliceen" of Albers. While adopting the subgeneric and specific names employed by Mr. Gulick, explanation is added of Pfeiffer's views from "Mon. Helic. Viv." VI, as to the validity of the species.

It will be seen, however, that, comparatively, the question as to specific names is of little consequence, inasmuch as the differences in forms of jaw and lingual dentition considered in the subjoined remarks are treated as of subgeneric and not of specific value.

1. PARTULINA, Pfr., p. 243 of "Die Heliceen."

<i>Auriculella jucunda</i> , Smith,	. . . . .	W. Maui.
" <i>solidissima</i> , Smith,	. . . . .	E. Maui.
" <i>solida</i> , Gulick,	. . . . .	Oahu.
(syn. of <i>splendida</i> , Newc. teste Pfr.)		
<i>Partulina plumbea</i> , Gul.,	. . . . .	E. Maui.
(syn. of <i>marmorata</i> , Gld., teste Pfr.)		
" <i>eburnea</i> , Gul.,	. . . . .	E. Maui.
(syn. of <i>Tappaniana</i> , Ad., teste Pfr.)		
<i>Apex pallida</i> , Nutt.,	. . . . .	Oahu.
<i>Bulimella tæniolata</i> , Pfr.,	. . . . .	Oahu.
(section <i>b</i> of <i>Partulina</i> , v. Mart.)		

2. BULIMELLA, Pfr., p. 244.

Not represented among the Gulick shells.

3. ACHATINELLA, s. str., p. 246.

<i>A. livida</i> , Swains.,	. . . . .	Oahu.
(var.? of <i>vulpina</i> , Fér. teste Pfr.; placed by v. Martens in this subgenus.)		
<i>A. varia</i> , Gul.,	. . . . .	Oahu.
(syn. of <i>vulpina</i> , Fér. teste Pfr.; of <i>fulgens</i> , Newc. teste v. Mart.)		

- A. producta*, Rv., Oahu.
A. Johnsonii, Newc., Oahu.
4. APEX, Alb. and v. Mart., p. 248.
 Not represented in the Gulick shells.
 [*Apex pallida*, Nutt., see above under *Partulina*, is treated by Pfr. as syn. of *lorata*, Pfr., non Fér. of the subgenus *Achatinella* s. str., while von Martens puts it in the syn. of *lorata*, Fér., in the subgenus *Partulina*.]
5. NEWCOMBIA, Pfr., p. 249.
Laminella picta, Mghs., W. Maui.
6. LAMINELLA, Pfr., p. 250.
Amastra Mastersi, Newc., E. and W. Maui.
 (syn. of *rubens*, Gld. teste Pfr.)
Amastra decorticata, Gul., on the ground, Oahu.
 " *luctuosa*, Pfr., " " " " "
 " *nigrolabris*, Smith, on trees, "
7. LEPTACHATINA, Gould, p. 251.
L. nitida, Newc., W. Maui.
L. grana, Newc., W. Maui.
L. dimidiata, Pfr., Oahu.
8. LABIELLA, Pfr., p. 252.
 Not represented among the Gulick shells.

The specimens were forwarded to Binney, the result of whose anatomical examinations are given below in detail. It may be stated here, however, that both in form of jaw and character of the lingual dentition, all the species of *Partulina* and *Achatinella* s. str. sent by Mr. Gulick agree. They all share a form of dentition quite uncommon in the *Helicidæ*. Of the same type of dentition is *A. bulimoides* examined by Heynemann. (See pl. xv, fig. 11.)

The jaw and lingual dentition of all Mr. Gulick's species of *Newcombia* and *Laminella* are alike, thus indicating a separate group for these subgenera. The lingual membrane shows the usual type of *Helicinæ*, but the central tooth is quite narrow. (See pl. xv, figs. 9-11.)

Similar to the last group in the form of jaw and character of central and lateral teeth are all the species of *Leptachatina* received from Mr. Gulick. They have, however, a different form of marginal tooth, distinguished by the blunt digitation of the reflected apex of the tooth (see pl. xv, fig. 8), which

in *Newcombia* and *Laminella* is simply bidentate or tridentate. This peculiar marginal tooth reminds one forcibly of that figured for *Partula* by Heynemann (Mal. Blatt. 1869), though the apex in his figure is not reflected as in *Leptachatina*.

Thus it appears that three groups are indicated by the forms of lingual dentition in the genus *Achatinella*.

a. *Partulina*, *Achatinella* s. str.

b. *Newcombia*, *Laminella*.

c. *Leptachatina*.

As regards the subgenera not represented among Mr. Gulick's specimens, judging from the shell alone, it would appear that *Bulimella* and *Apex* belong to the group *a*, while *Labiella* will prove to belong rather to *b* or *c* than to *a*.

In the subjoined remarks on the anatomy of the genus it will be shown that there is another peculiar character, the division of the ovary (albumen gland of Moquin-Tandon) into long, wavy, delicate, thread-like cæca. No doubt this is a generic character, so constant was it in all of Mr. Gulick's specimens examined, both of sections *a* and *b* indicated above.

In this connection it is interesting to state that Mr. Gulick, in his paper "On the Variation of Species as related to their Geographical Distribution, illustrated by the *Achatinellæ*," (Nature, July 18, 1872), states as follows: "The family is divided into two natural groups of genera. The first group consists of seven genera: *Achatinella*, *Bulimella*, *Helicterella*, *Partulina*, *Newcombia*, *Laminella* and *Auriculella*. These are all arboreal in their habits. In form they are sinistral, or both dextral and sinistral. The second group consists of three genera: *Amastra*, *Leptachatina* and *Carelia*.* With but few exceptions, the species of *Amastra* and *Leptachatina* live on the ground and are of dextral form."

This division, apparently based more especially on the sinistral or dextral characters of the shells, and arboreal or

* *Carelia*, H. and A. Ad., a subgenus of *Achatina*, teste von Martens.

terrestrial habits of the animals, is evidently faulty, seeing that, irrespective of such characters and habits, the *Achatinellæ*, dentition considered, may be very properly divided into two, perhaps three, subgenera, alike embracing forms comprised in each of Gulick's groups.

The details of anatomy here follow.*

In *Laminella Mastersi* the jaw is low, wide, slightly arcuate, ends but little attenuated, blunt; it is of horn color, thickest on the cutting edge, gradually thinning off to the upper margin. There is no median projection to the cutting edge. The anterior surface is without ribs. Of the same type is the jaw in all the species of *Laminella* examined. It is very wide, very low, and hardly arcuate in *luctuosa*. I find the same type of jaw also, though much more arched, in all the species of *Newcombia* and *Leptachatina* examined. In *picta* there is a slightly produced, blunt, median projection to the cutting edge. All these species have jaws readily boiled out by caustic potash, and usually remaining attached to the lingual membrane in the test tube after the process. There are delicate vertical striæ on several of them, sometimes shown only by a very strong power. In all the other species submitted to me the jaw is so extremely delicate as to be found with difficulty. I failed to extract it in *Achatinella Johnsonii*, *livida* and *varia*.† In the other species of *Achatinella*, and in all of *Partulina*, the jaw appears to be simply arcuate, transparent, extremely thin, ends blunt.

The lingual membrane is of the same type as figured for *Partulina bulimoides* by Heynemann (Mal. Blatt. XIV), in all the species of *Achatinella* s. s., and *Partulina*. It is very broad in comparison to its length. In one specimen the formula is 175-1-175.‡ The teeth are arranged *en chevron*. There is but one type of teeth for centrals, laterals and marginals, the former being, however, somewhat smaller, and symmetrical. The teeth are long, narrow, bluntly truncated below, curving and widening at first gradually, then more rapidly, so that the apex is more than twice the breadth of the base; it is reflected along its whole breadth, slightly produced, seven-cuspid, the central cusp the smallest. There is variation in these cusps.

In *Newcombia*, *Laminella* and *Leptachatina* the lingual membrane is entirely different. It is as usual in the *Helicinæ*, narrow compared with its length, the teeth arranged in horizontal rows. The centrals are long, narrow, somewhat wider at base (where there are two long, parallel,

* I alone am responsible for these anatomical details.—W. G. B.

† The process of extraction by potash is not adapted to this slightly developed jaw; even by dissection it is very difficult to obtain the jaw; when mounted in glycerine jelly it speedily becomes too transparent to be studied under the microscope.

‡ Counted by my young friend A. Ten Eyck Lansing, to whom I am indebted for valuable aid in dissecting the specimens.

longitudinal lines of reinforcement), again enlarged at apex, which is reflected, slightly produced, and bluntly tricuspid, the outer cusps almost obsolete. The lateral teeth are subquadrate, more than twice as broad as the centrals, the reflected portion greatly produced and bicuspid. There are about eight perfect lateral teeth in *Leptachatina grana*, the formula being 20-1-20. In *Laminella luctuosa* the formula is about 22-1-22. In *L. Mastersi* 26-1-26, with eight perfect laterals. The marginal teeth in *Laminella* are merely a simple modification of the laterals, they are low, subquadrate, with one long, oblique, blunt inner denticle and two smaller, outer denticles. In *Laminella* the denticles are more numerous and more pointed. In all the *Leptachatina* the marginal teeth are of a different type. They seem to have but one very broad cusp, whose outer edge is irregularly digitate or fringed, the points being about eight, but varying in number and position.

To illustrate the jaws and lingual membranes I have selected (fig. 10) one central and one lateral of *Laminella Mastersi*, a group of centrals and laterals of the same (fig. 11), with a group of marginals of the same (fig. 9.) Fig. 2 gives one central and several adjacent laterals, from either side, of *Achatinella producta*. Fig. 8 gives several marginal teeth of *Leptachatina nitida*. Fig. 7, the jaw of *Laminella Mastersi*. Fig. 6, the jaw of *Laminella picta*.

It will be noticed that the lingual membrane of *Newcombia*, *Laminella* and *Leptachatina* resembles that of *Stenogyra* in its extremely small central tooth. The jaw also is of the same type.

The following species were found with embryonic shells in the oviduct, usually only two in number and of very unequal size, *Newcombia picta*, *Laminella decorticata*, *luctuosa*, *Partulina eburnea*, *teniolata*, *Achatinella producta*. Heynemann, l.c., found them also in *bulimoides*.

A peculiarity of the genus seems to be a perfectly black lung, in great contrast to which are the two divisions of the heart and the renal organ, all decidedly white.

Another peculiarity of the genus is a short foot, broad in front, rapidly narrowing towards the pointed tail. In *Partulina pallida*, however, the tail is long. Also in *Partulina eburnea*. In many of the specimens I noticed an unusual development of the blind sac under the mouth (supposed by Dr. Leidy to be the seat of the olfactory nerve). I believe this to be a generic characteristic also.

I noticed nothing unusual in the nervous ganglia, or in the digestive apparatus, examining each system carefully in several species, the upper portions of the digestive system especially in *Partulina pallida*.

The reversion of the shell, common in the genus, seems accompanied by a corresponding sinistral arrangement of the internal organs. Thus the orifice of generation, usually on the right of the animal in the snails, is, in the sinistral *Achatinellæ*, on the left. I have verified this fact in *eburnea*, *varia*, *livida* and *Johnsonii*.

So far as can be judged from alcoholic specimens, it seems that the external orifice of the generative organs is usually under the mantle, not

behind the tentacle; this I believe to be a generic characteristic, but the fact must be confirmed in the living animal. It must surely be so in many species, among which I may mention *Johnsonii* and *tæniolata*. It is not so, however, in *pallida*.

Another peculiarity is the whiteness noticed in the internal organs of almost all the species examined. The whole digestive system seemed injected with a dead white fluid.

The generative system presents several peculiarities, but in its general arrangement is the same as in the other shell-bearing snails. The testicle is embedded in the extreme apex of the shell, in the upper lobe of the liver. The epididymis is long, greatly convoluted near the oviduct. The accessory gland appeared in several species (for instance in *Mastersi*, *varia*, *tæniolata* and *producta*) to be composed of several long, white cæca. This appears to be a generic characteristic, as does also the peculiarly constituted ovary.*

Instead of the single, homogeneous, tongue-shaped mass usually seen in the *Pulmonata*, I have invariably found the ovary in *Achatinella* to be composed of numerous, long, delicate, crimped, thread-like cæca, free excepting at their base, where they converge to the top of the oviduct, I noticed this form of ovary in *tæniolata*, *Johnsonii*, *pallida*, *livida*, *varia*, *eburnea*, *Mastersi* and *luctuosa*, besides other species less thoroughly examined. The cæca are bound together in one irregularly ovate mass by an investing membrane, which, when opened, allows the cæca to spread out in the form represented in pl. xv, fig. 4. This peculiar ovary is the most interesting point in the genus, so unlike the corresponding organ in the other snails whose anatomy is now known. The oviduct is not convoluted, but simply long and sac-like (with extremely thin sides), ending in a narrow, tubular cloaca. The remaining organs were not readily examined, on account of the animals having apparently been boiled, or otherwise rendered difficult of dissection without breaking the continuity of several of the ducts and organs, though the same general arrangement (especially as to inter-connection) of penis, vas deferens, etc., was noticed by me in *tæniolata*, *livida*, *varia*, *eburnea* and *pallida*.

I have given a figure of the genitalia of one species only, *A. producta*, which I succeeded in retaining in perfect condition. It will be noticed (fig. 4) that the *vas deferens* proceeds directly from the base of the ovary and is free in its whole length, though lying close upon the oviduct. It enters the penis at its side, just below its apex. From the apex of the penis sac is a delicate duct to the long organ marked *a* on the figure. This organ runs from the base of the ovary to the apex of the sac-like organ marked *b*. As there appears to be no prostate gland along the side of the oviduct, it occurs to me that the organ *a* may be a form of prostate, lubricating both the penis and the organ marked *b*. The last is a dart sac, or a prostate, probably the latter. Its long flagellum

*I use the terms applied to the organs by Dr. Leidy in "Terrestrial Mollusks of United States," I.

(c) in its natural position lies as in fig. 5, directly under the respiratory cavity, over the other genital organs. The genital bladder (d) was found almost embedded in the ovary.

Nanina Chamissoi, Pfr.

With the *Achatinellæ* were specimens of a small *Nanina* from Oahu and another species from West Maui. The latter is pronounced by Dr. Newcomb to be young of the above named species. Both of these species have similar lingual teeth. Those of the West Maui species are figured in pl. xv, fig. 3. The centrals and laterals are as usual in the genus; there are ten perfect laterals. The marginals are aculeate, but instead of the usual simply bifid point, they have three and four points. The tooth figured was the very last on the edge of the membrane. No perfect jaw was obtained in either species, though a simple arcuate smooth jaw was recognized in that from Oahu, of too extreme delicacy to be satisfactorily studied.

The species belongs to the subgenus *Microcystis*.

Succinea canella, Gld.

From West Maui also was this species of *Succinea*, whose jaw and lingual membrane are as usual in the genus.

Zonites Gundlachi, Pfr.*

Mr. A. Schramm, Guadeloupe. The species is also found in Florida and several of the W. I. Islands.

Jaw not examined.

Lingual membrane arranged as usual in the genus. Centrals tricuspid, laterals bicuspid, about seven of the latter being perfectly shaped laterals. Marginal teeth aculeate, of the form usual in the genus, but bifid, and sometimes trifid (see pl. xv, fig. 1). The species is viviparous.

*This species, like *Z. fulvus* (L. & F.W. Shells N. A., I, 47, fig. 75), differs from *Zonites* in the bifurcation of the marginal teeth of its lingual membrane. It must be compared to *Vitrinoconus*, Semper, Phil. Arch., p. 91.

Stenopus has teeth arranged as in *Glandina*, with no laterals. Our species cannot therefore belong to it.

Helix uvulifera, Shuttleworth (*Polygyra*).

Sarasota Bay, Florida, Dr. W. Newcomb.

Jaw low, arcuate, ends blunt, anterior surface with about thirteen ribs, denticulating either margin.

Lingual membrane as we have figured for *H. auriculata*. (Land and Fresh Water Shells, I, p. 87, fig. 158.)

Veronicella occidentalis, Guilding.

Guadeloupe, Mr. A. Schramm.

Jaw and lingual membrane as usual in the genus, the former with about thirty ribs. (See Amer. Journ. of Conch., VII, 163, pl. xii, fig. 7 and L. and F. W. Shells, I, p. 304, fig. 539.)

The head, eye-peduncles and tentacles of the specimens, preserved in alcohol, were entirely withdrawn, the aperture through which they withdrew being very conspicuous. The tentacles and eye-peduncles are contractile, as described. There appears, properly speaking, to be no distinct locomotive disk to the foot. Such a disk has been described for the genus, owing to authors considering the reflected edges of the mantle as portions of the foot. These give, indeed, a tripartite appearance to the base of the animal, but the foot itself is not divided.

Onchidium Schrammi, nov. sp.

In the absence of any satisfactory published figure of the lingual dentition of the genus *Onchidium*, we give on pl. xvi, figs. 3-5, figures of that of a species sent to us by Mr. A. Schramm, from Pointe à Pitre, Guadeloupe. He collected many specimens, thus describing their station. "Sous des galets au bord de la mer, dans la rade de la Pointe à Pitre, en société avec des Nerites, des Auricules et des Pedipes."

The external appearance of the species, which may be called after the discoverer, is as usual in the genus. The body is elliptic in shape, green in color, about eighteen millimeters long (contracted in spirits), flat

below, convex above, with a rounded slightly prominent ridge along the back, on which the skin is smoother than on the balance of the body, and where the tuberosities are much less conspicuous. The foot has no proper locomotive disk, though the broadly reflected mantle edge has usually been counted as a portion of the foot and has given rise to the impression that the foot of *Onchidium* is divided into three longitudinal bands, of which the central is a locomotive disk. The eye-peduncles are surely retractile, being found completely inverted in all the specimens examined. This confirms the recent observations of Dr. Stoliczka.*

We found no jaw in the specimens.

The lingual membrane is broad. The teeth are arranged *en chevron*. They are crowded closely together, the individual teeth and separate rows of teeth overlapping each other. The central tooth has somewhat the outline of a truncated cone, narrow and squarely truncated above, gradually widening and curving outward toward the base, which is much broader than the top, and is incurved with acutely pointed corners. The top of the tooth projects beyond the reflected cutting edge, which is small and tricuspid. The first lateral is about the same size as the central. Its squarely truncated apex extends beyond the reflected cutting edge, which is bicuspid, the outer cusp subobsolete, the inner much larger and extended into a long, broad, squarely truncated point, reaching almost to the base of the tooth. This last is hidden behind the central, is long and gradually attenuated to its blunt base. The second lateral is of same shape as the first, but one-half longer and larger, the third and fourth laterals also increase in like proportion. The general direction of all the laterals is a curve outward from the central. There are no distinct marginal teeth.

Fig. 5 (pl. xvi) gives a group of centrals and laterals from two adjacent rows of teeth. Fig. 3 shows one central with its adjacent two laterals more enlarged, and purposely separated. Fig. 4 shows one lateral in profile.

This lingual is instructive from showing a combination of the characters of the quadrate teeth of *Helicinæ* and the aculeate teeth of *Vitrininae*, the last most evident in the profile. In profile, however, the reflected cusp is not of the sharp, thorn-like character of *Vitrina*, *Zonites*, etc. We should rather consider the teeth as decidedly quadrate, the base of attachment, or plate, being extended beyond the top of the reflected cusp.

* Many years ago the eye-peduncles of *Onchidium* were described as retractile by Forbes and Hanley, yet of late years most authors have treated them as contractile, as in *Veronicella*.

We are indebted to our young friend A. Ten Eyck Lansing for assistance in the study of this lingual.

Heynemann's figure of the dentition of *Peronia* (*Onchidella*) is somewhat similar to that described above, at least in the general form and arrangement of the teeth. (Mal. Blatt., 1868, XV, pl. iii, fig. 10.)

***Helix picta*, Born (*Polymita*).**

A Cuban species. The specimen examined was captured on a bunch of bananas in New York by Mr. M. Brandigee, who kindly sent it to Bland.

Jaw (pl. xvi, fig. 1) thick, arched, high, ends bluntly rounded, but little attenuated; anterior surface without ribs; cutting edge without median projection; a transverse, median line of reinforcement.

Lingual membrane (pl. xvi, fig. 2) long and broad. Teeth arranged strongly *en chevron*, of uniform shape on all parts of the membrane. Centrals long, narrow, bluntly truncated at top, slightly incurved at sides, rounded and fringed at base, near which is the gouge-shaped, expanded, tricuspid cutting edge. The central cusp is bluntly rounded, the exterior cusps curve outward and are pointed. The lateral teeth are of the same form with the centrals, but are slightly unsymmetrical. There are no distinct marginal teeth.

By its jaw and lingual membrane, *Helix picta* is closely allied to *Helix muscarum*, Lea (see Amer. Journ. of Conch., VI, 204, pl. ix, figs. 4, 16). The last named species is, however, placed by von Martens in the subgenus *Polymita* and *picta* in *Liochila*. There can be no doubt that both species belong to the same subgenus, but as *Helix muscarum* is the type of *Polymita*, that name must be retained instead of *Liochila*. We anticipate finding the same curious type of lingual dentition in *H. sulphurosa*, Morel. (which is scarcely distinguishable from *H. picta*), also referred to *Liochila* by von Martens, but are scarcely prepared to expect it in *Liochila Jamaicensis*, Chem. The latter, which is the type of *Liochila*, will therefore remain undisturbed in its systematic position, unless, indeed, it belongs to *Thelidomus*, in which case the name *Liochila* will be placed in the

synonymy of the last named subgenus. Of the species referred to *Polymita* we presume none will prove to have similar dentition unless, as may probably be the case, *H. versicolor*, Born, so that the others must all be removed from *Polymita*, to form a distinct subgenus under the name of *Hemitrochus*, Swainson, 1840. We have, however, ourselves examined only *H. varians*, Mke., *Troscheli*, Pfr., *gallopavonia*, Val., and *graminicola*, Adams, all of which have the usual form of lingual teeth of the *Helicidæ* (see Amer. Journ. Conch., VI, 206, VII, 178, and L. and F. W. Shells, N. A., VI, 185, fig. 325). The jaw offers no subgeneric character to distinguish the two subgenera *Polymita* and *Hemitrochus*.

The long, subquadrangular lingual tooth, not reflected along its upper margin as usual in the *Helicidæ*, but bearing the gouge-shaped, expanded, cutting edge, soldered as it were upon its surface, has never been noticed by us before in the genus *Helix*. It is, however, characteristic of *Orthalicus*,* of *Gæotis*,† and of the marginal teeth of *Liguus*.‡

Our fig. 1, of pl. xvi, represents the jaw of *H. picta*. Fig. 2 gives two central teeth of the lingual membrane with the adjacent laterals.

***Helix gallopavonis*, Val. (*Hemitrochus*).**

Jaw as in *Helix varians* (see L. and F. W. Shells, I, p. 185, f. 325) and *H. Troscheli* (herewith described).

Lingual membrane as usual in the *Helicidæ*. Cusps of centrals and laterals stout, short, with short points; side cusps subobsolete. The reflected cutting portion of both centrals and laterals does not reach beyond the middle of the plates, which are very long. Marginal teeth low, wide, with four or more short, oblique, bluntly rounded denticles, the two inner ones the largest.

We are indebted for the specimen examined of this Turk's Island species, and the following one from New Providence, Bahamas, to Governor Rawson.

* See Amer. Journ. Conch., VI, 212, 213, pl. ix, figs. 2, 10, 12.

† See Ann. N. Y. Lyc. Nat. Hist., X, 252, pl. xi, figs. 5, 6, 7.

‡ See Amer. Journ. Conch., VI, 209, 211, figs. 4, 5.

Helix Troscheli, Pfr. (*Hemitrochus*).

Jaw stout, decidedly arched, high, ends attenuated, blunt; a decided, small median projection to cutting edge, a strong transverse line of reinforcement.

Lingual membrane as usual in the genus. Centrals very long, the reflected cutting edge greatly produced above and not extending to the base of the plate, side cusps obsolete, median cusp with a short point. Laterals like the centrals, but unsymmetrical, the upper portions still more produced. Marginals quadrate, with one large, oblique, rounded, bluntly bifid denticle, and one or two small, blunt, side denticles. The membrane is peculiar in the extension of the centrals and laterals at their upper margin.

Amphibulima (Succinea) appendiculata, Pfr.

We have already fully described (Ann. Lyc. N. H. N. Y., X, 206, pl. ix, f. 2, 6, 9-11) the external appearance, jaw, lingual membrane and shell of this species, pointing out its differences from *Succinea*, from *Pellicula*, from *Omalityx* and all other described genera, but hesitated to decide upon its generic position, leaving it temporarily in *Pellicula* of Fischer (not of Heynemann which is *Omalityx*).

Being now better acquainted with the jaw of *Amphibulima* and finding that of our *appendiculata* (believed by us to be the *appendiculata* of Pfeiffer) of the same type, we place the species in *Amphibulima*.

Its lingual dentition more closely resembles that of *Simpulopsis sulculosa*, so far as centrals and perhaps laterals are concerned, but in the marginals, as described in *S. sulculosa* and *S. Portoricensis*, the resemblance ceases.

Moreover *A. appendiculata*, Pfr. cannot be placed in *Simpulopsis*, the jaw of which, according to Shuttleworth, is quite different.*

Fischer bases his genus *Pellicula* on *Succinea depressa*, Rang, in the synonymy of which he has *S. appendiculata*, Pfr., but the specimens of the latter under our consideration cannot be the same as Fischer's of *depressa*. His specimens

* See Bland and Binney, Ann. Lyc., X, 198.

are described as having a jaw with nine decided ribs* denticulating the cutting edge and teeth of the usual form of the *Helicinæ*—quite different from our *appendiculata*, which is, we believe, distinct from his species.

Pellicula convexa, Martens (*Succinea*), belongs to the genus *Omalonyx*, as shown by Heynemann's figure of the jaw (Malak. Blatt., XV).

***Amphibulima patula*, Brug.**

We have elsewhere described the lingual membrane of this species from a Dominica specimen (Am. Journ. Conch., VII, 186, pl. xvii, f. 1, 2,) and the jaw of one from St. Kitts (Ann. Lyc. N. H. N. Y., X, 225, pl. xi, f. 8).

It has lately been suggested by Schramm (Journ. de Conch., XIII, 127, April, 1873) that this species belongs exclusively to the fauna of Guadeloupe, and does not exist in the neighboring islands. We have seen one fossil example only from Guadeloupe, but on comparing it with fresh specimens from St. Kitts and Dominica are satisfied, judging from the shells, that all are of one and the same species.

Considering Schramm's views, we have again carefully examined the lingual membranes already described of the St. Kitts and Dominica forms, to ascertain whether they present differences of specific value. It may be mentioned that the shells from the latter island, several of which are in the cabinet of the late Mr. Robert Swift, are smaller than those from St. Kitts.

We find that the Dominica form has sharper cutting points to the large cusps of its central and lateral teeth than in the St. Kitts' examples, while the laterals of the latter show greater constancy in the square truncation of the cutting points.

The teeth of the St. Kitts linguals are broader in proportion to their length, have a greater curve in their outlines and

* In Fischer's plate the references to the teeth of *Omalonyx unguis* and *Pellicula depressa* are reversed.

more developed side cusps, which overlap the median cusps, than in those from Dominica.

The marginal teeth of the former exhibit a greater tendency to splitting into sharp denticles on the cutting cusps than those of the latter island.

The Dominica lingual, in the only row counted, has 87-1-87 teeth, one in the St. Kitts form has 57-1-57.

These differences in the lingual membranes are noticeable, but we believe, especially as the shells are identical, that they are not of specific value.

***Amphibulima (Succinea) rubescens*, Desh.**

We are indebted to Governor Rawson for specimens (preserved in alcohol) of this species from Martinique.

On examination of the jaw and lingual membrane, we found that the species is not a *Succinea*, but an *Amphibulima*,* in which genus it is placed by Beck (Index, p. 98) and by H. and A. Adams (Gen. Rec. Moll., 129), although Pfeiffer treats it as a *Succinea* and v. Martens (Die Heliceen, ed. 2nd, 310) catalogues it in *Succinea* s. str.†

The jaw agrees perfectly with that of the genus *Amphibulima* described by us (Ann. Lyc. N. H. N. Y., X, p. 225, pl. xi, fig. 8). There are about sixty delicate ribs. The lingual membrane has also the same general arrangement as in that genus (*l.c.*, fig. 9) with specific differences from that of *A. patula*, especially in the widely expanded, blunt, median cusp of the central tooth, and in the *Succinea*-like cutting away of the lower margin of the teeth. The marginal teeth of *A. rubescens* resemble those we have figured of *Gæotis* (*l.c.*, pl. xi, fig. 7).

A. rubescens occurs also in the environs of Cayenne (Drouet, Moll. de la Guyane Française, p. 49).

* See our note on p. 345 of Journal de Conchyliologie, XIII, Oct., 1873.

† Since sending the above to the printer, we have received the Journal de Conchyliologie, 3d series, XIII, No. 4, Oct., 1873. On p. 324, is a description of the jaw and anatomy of this species by Dr. Fischer, who suggests the subgeneric name *Rhodonyx*, overlooking its generic identity with *Amphibulima*.

***Omalonyx felina*, Guppy.**

We have received, from Mr. R. J. Lechmere Guppy, specimens preserved in glycerine of his *Amphibulima* (*Omalonyx*) *felina*, from Trinidad. On examining the jaw and lingual membrane, we find the species to be a true *Omalonyx*, both organs being the same as have been described for that genus. (See Ann. N. Y. Lyc. Nat. Hist., X, 203, *O. unguis* of Brazil and Guadeloupe.)

We have already (*l.c.*, p. 204) stated our belief that *O. felina*, judging from the shell alone, is specifically identical with the Guadeloupe *O. unguis*.

***Lithotis rupicola*, Blanford.**

Sometime since Bland was indebted to Colonel Jewett for specimens of this interesting species, from one of which he obtained the jaw and lingual membrane.

Pfeiffer (Nov. Conch., IV, pp. 11 and 12, pl. cxii, figs. 1-4) describes and figures *Succinea rupicola* Blanford (subgenus *Lithotis*) quoting the name from the catalogue of Dr. Dohrn's collection, remarking that he had no information as to the work in which the subgenus and this, the typical species,* had been characterized.

The shell has a certain similarity to that of *Succinea* but the species does not belong to the Elasmognatha.

L. rupicola is found on rocks at an elevation of 2,000 feet in the mountains near Bombay.

The jaw is arcuate, with a depression or excavation at the centre of its upper margin; scarcely attenuated towards the ends; cutting edge with a decided median projection; anterior surface with vertical striæ, but no trace of ribs.

The lingual membrane is as usual in the *Helicinæ*, the marginal teeth being quadrate, not aculeate. The centrals are long and narrow, with lateral expansions at the lower margin; the reflected portion has one stout median cusp with a point reaching nearly to the lower margin of the

* *Succinea* (*Lithotis*) *tumida* was described and figured by Blanford in Journ. As. Soc. Bengal, 1870. See also Nov. Conch., *l.c.*

tooth, the side cusps being subobsolete. The lateral teeth are like the centrals, but unsymmetrical. The marginal teeth are about as wide as high, with one stout, pointed inner cusp, and two short, side cusps.

***Helix provisoria*, Pfr. (*Thelidomus*).**

New Providence, Bahamas (also Cuba). Gov. Rawson.*

Jaw very slightly arcuate, wide, low, of about equal height throughout; ends blunt; anterior surface with 10-15 ribs, separated by irregular intervals, not always reaching the cutting edge, which has a broad, blunt, median projection.

Lingual membrane with numerous rows of about 40-1-40 teeth, as usual in the *Helicidae*, the marginals having one large and one side, small, blunt cusp, projecting but slightly beyond the base of the tooth.

***Glandina solidula*, Pfr. (*Oleacina*).**

New Providence (also Cuba).

Lingual membrane as usual in the genus.

***Bulimulus sepulcralis*, Poey (*Leptomerus*).**

New Providence (also Cuba).

Jaw stout, wide, low, arcuate, of about equal height throughout; ends bluntly rounded; with fifteen stout, broad, crowded ribs, their ends crenellating either margin. Some of these ribs are of equal thickness throughout their whole breadth, and are separated by decided narrow interstices. The jaw cannot, therefore, be said to be in numerous plate-like sections separated by narrow ribs, as is usual in *Bulimulus*. This jaw is of interest as showing the passage from the jaw of *Cylindrella*, *Bulimulus*, etc., to that of *Helix*, having some of the characters of each.

Lingual membrane as usual in the *Helicidae*. Side cusps of centrals and laterals obsolete, median cusp long, with a long point, passing beyond the base of the tooth. The upper margin of the centrals is incurved. Marginal teeth a modification of the laterals, with one long, narrow, blunt, inner denticle, and one or two short side denticles of similar shape.

*The animals of this, the four following, and other Bahamas species were sometime since received from Gov. Rawson by Bland, to whom the shells collected by the late Dr. Bryant were referred by the Boston Society of Natural History. The jaws and lingual membranes of the species were placed by Bland at the disposal of the society, and at his suggestion were mounted for microscopic examination. We are indebted to the Society for the use of the slides.

***Strophia decumana*,* Fér.**

Castle Island, Bahamas.

Jaw stout, strongly arcuate, ends slightly attenuated, bluntly rounded; anterior surface ribless, transversely striate, and with several stout lines of reinforcement; a small, blunt, median projection to cutting edge. (See our fig. 431, p. 247, of L. and F. W. Shells, I, for jaw of *S. incana*.)

Lingual membrane as usual in the *Helicidae*. Teeth about 30-1-30, about as broad as long, short, broad, with short, stout, bluntly pointed median cusps and subobsolete side cusps, upper margin of teeth rounded. Marginal teeth simply a modification of the lateral, with one inner, large, and one outer, small, stout, blunt, oblique denticle.

***Strophia Mumia*, Brug. var.?**

Abaco, Bahamas (also Cuba).

Jaw slightly arcuate, stout, rough, rather high, ends but little attenuated, blunt; cutting edge with a wide, blunt, slightly developed median projection.

Lingual membrane with about 30-1-30 teeth. Centrals short and broad, the upper margin rounded and reflected into a short, broad cutting projection, with one stout, short, median cusp, bearing a stout point, and subobsolete side cusps. Laterals like the centrals, but bicuspid and unsymmetrical. Marginals long, low, with irregular, short, blunt, oblique, stout denticles, usually about four, the inner two the largest.

***Pupa fallax*, Say (*Leucochila*).**

We are indebted to Mr. A. G. Wetherby for Ohio specimens, from which we extracted the jaw and lingual membrane here described.

Jaw wide, low, slightly arcuate, ends blunt, but little attenuated.

Lingual membrane as usual in the genus. (See our L. and F. W. Shells of N. A., I, p. 233, figs. 395, 401, 409.) Teeth about 15-1-15, with about seven perfect laterals. Centrals quite narrow, the reflected portion very small, tricuspid. Laterals quite broad, bicuspid. Marginals quadrate, low, wide, with one inner, long, oblique, blunt denticle, and several outer, small, irregular, blunt denticles. The outer lower edges of the centrals and laterals have the projecting or short reinforcements shown in the figures referred to above.

* See remarks on this species by M. Crosse, in Journ. de Conch., VIII, 3d Ser., p. 337, 1868.

Though we retain the species in the genus *Pupa* it must be remembered that as treated by Pfeiffer it would be placed in *Buliminus* of Albers and Martens. In general form of shell it certainly approaches *Buliminus montanus*, Drap.

***Limax Hewstoni*, J. G. Coop.**

San Francisco, received from Mr. Stearns. We presume the specimens belong to this species.

Jaw and lingual membrane as usual in the genus. No bifurcation to the marginal teeth. Teeth about 30-1-30, with fourteen perfect laterals.

The teeth are quite of the shape of those figured on p. 59 of our "L. and F. W. Shells." The side cusps of the centrals and laterals are well developed.

***Erinna Newcombi*, A. Ads.**

In the collection of the late Mr. Robert Swift, presented by his daughter, Mrs. A. L. Washburne, to the Academy of Natural Sciences of Philadelphia, but temporarily in the charge of Bland, he found specimens of this species, given to Mr. Swift by Dr. Wesley Newcomb.

The genus *Erinna*, referred to the family *Limnæidæ*, was described by H. and A. Adams, in the Zool. Proc., 1855.

The authors remark, "This shell (*E. Newcombi*) by some would be referred to *Neritina*, by others to *Limnæa*, and possibly by a few to the genus *Otina*; it appears, however, to be distinct in character from all these."

From one of the specimens in the Swift collection the jaw and lingual membrane here described were obtained.

To satisfy himself as to the shells, Bland sent one for examination to Dr. Newcomb, who in reply has kindly furnished the following information as to the habitat and station of the species:—

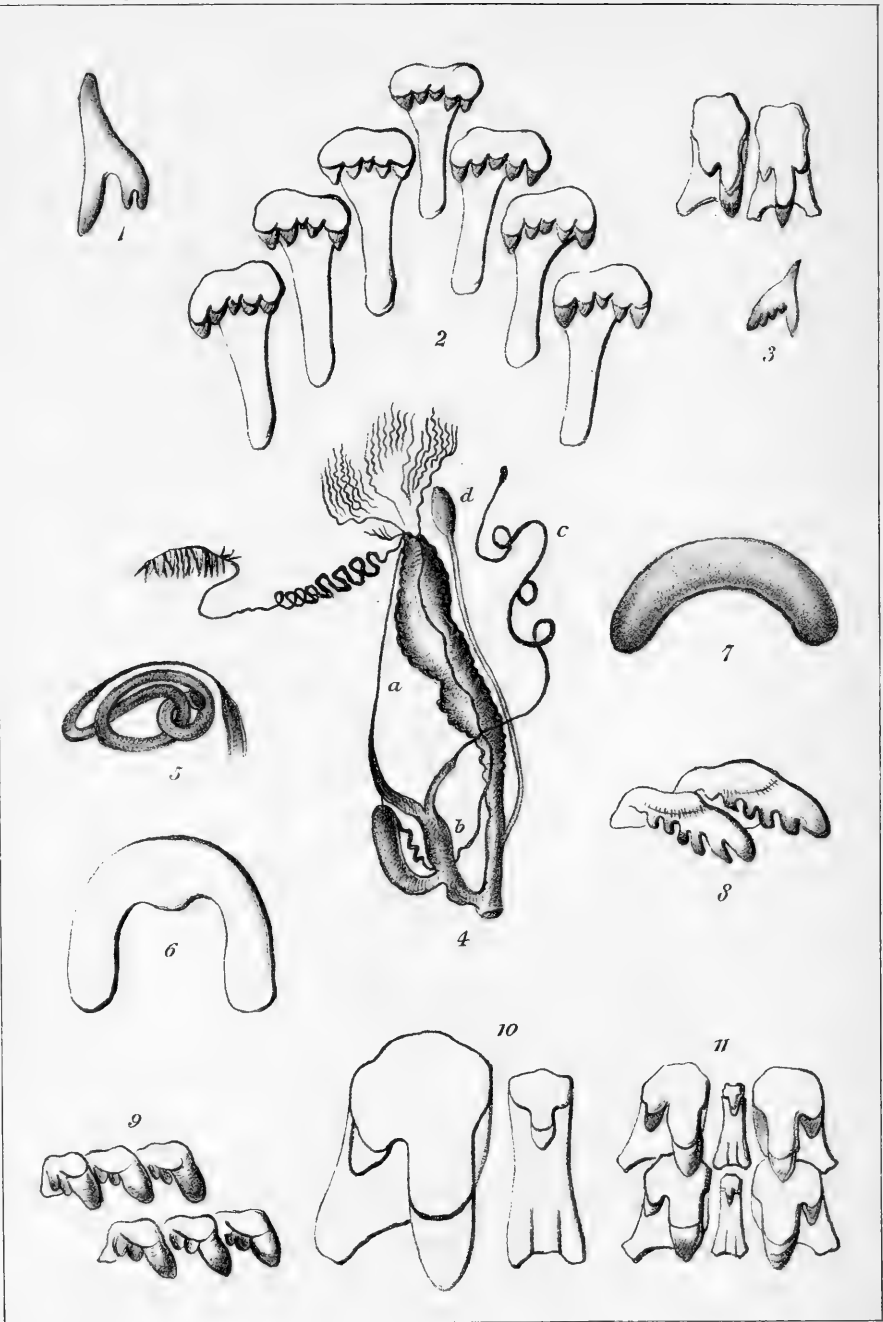
"The specimens were forwarded by me to Mr. Swift in about 1852 or 1853. They were collected high up the stream called the Hanelei River, on the Island of Kauai. At a fall in this river, the spray is thrown over the rocks, keeping them constantly wet; from these rocks the shells were taken.

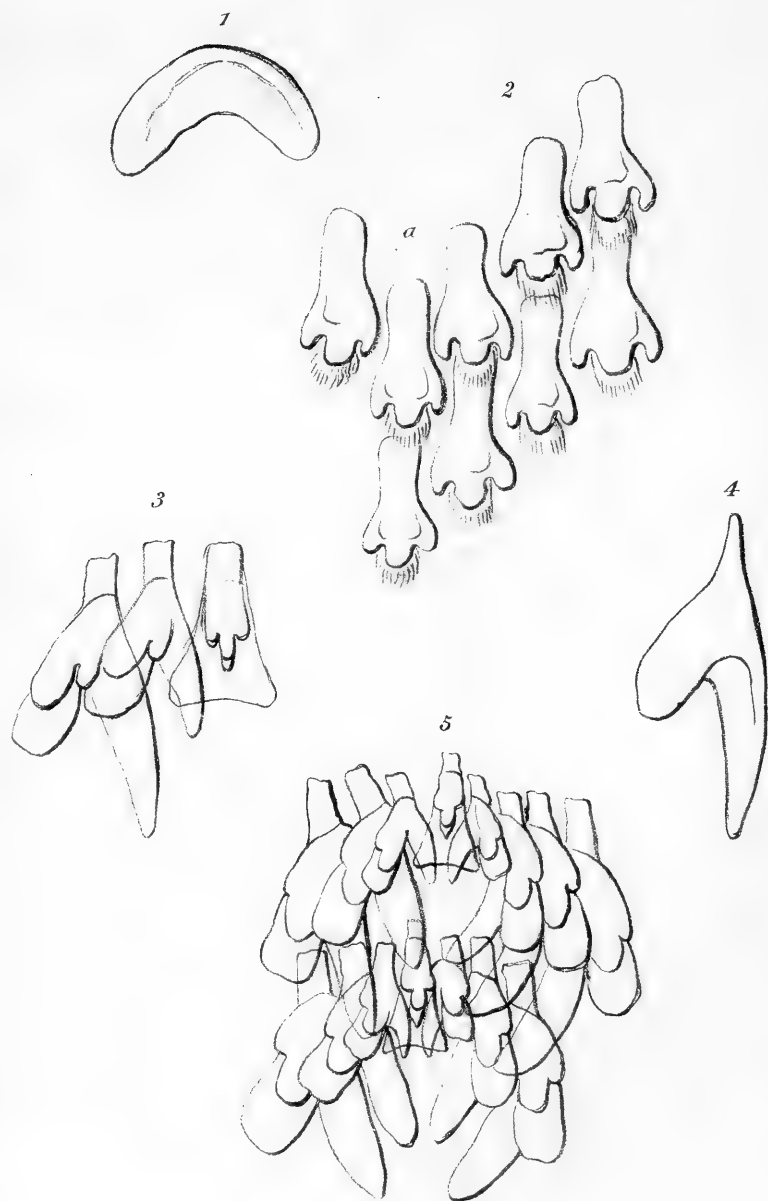
On repeated subsequent visits to the same locality I failed to find any more."

The jaw is low, wide, slightly arcuate, ends pointed; a decided median projection to the cutting edge; anterior surface smooth. There is no appearance of a supplementary plate as in *Succinea*.

The lingual membrane is as usual in the *Helicina*. The central tooth is long and narrow, small in proportion to the laterals, the reflected portion has one long median cusp, the side cusps being subobsolete. The lateral teeth are wide, broad as long, the reflected portion almost as large as the whole base of attachment, and tricuspid, the inner cusp very small, the median cusp large and bluntly truncated, the outer cusp smaller than the median and bluntly pointed. The marginal teeth are subquadrate, wider than high, the apex reflected, obliquely produced and bearing five or more blunt, short denticles, of which the inner two are the largest.

This description proves that the species is more nearly related to *Pupa*, *Clausilia* and *Stenogyra* than to *Succinea* among the *Helicidae*, but it may well prove to be a *Limnæan*, as suggested by H. and A. Adams. As such it must be compared to *Pompholyx*.





EXPLANATION OF PLATE XV.

Fig. 1. *Zonites Gundlachi*, Pfr. One marginal tooth of the lingual membrane.

Fig. 2. *Achatinella producta*, Rve. One central and adjacent lateral teeth.

Fig. 3. *Nanina Chamissoi*, Pfr. (See p. 338.) One central, one lateral and one extreme marginal.

Fig. 4. *Achatinella producta*, Rv. The genital system enlarged. *a*, see p. 337. *b*, Vaginal prostate? *c*, Flagellum of same. *d*, The genital bladder.

Fig. 5. Same as *c* of fig. 4, as it lies in the animal.

Fig. 6. *Newcombia picta*, Mighels. Jaw.

Fig. 7. *Laminella Mastersi*, Newc. Jaw.

Fig. 8. *Leptachatina nitida*, Newc. Marginal teeth.

Fig. 9. *Laminella Mastersi*, Newc. Marginal teeth.

Fig. 10. Same. One central and one lateral, still more enlarged.

Fig. 11. Same. A group of central and lateral teeth. Same scale of enlargement as fig. 9.

PLATE XVI.

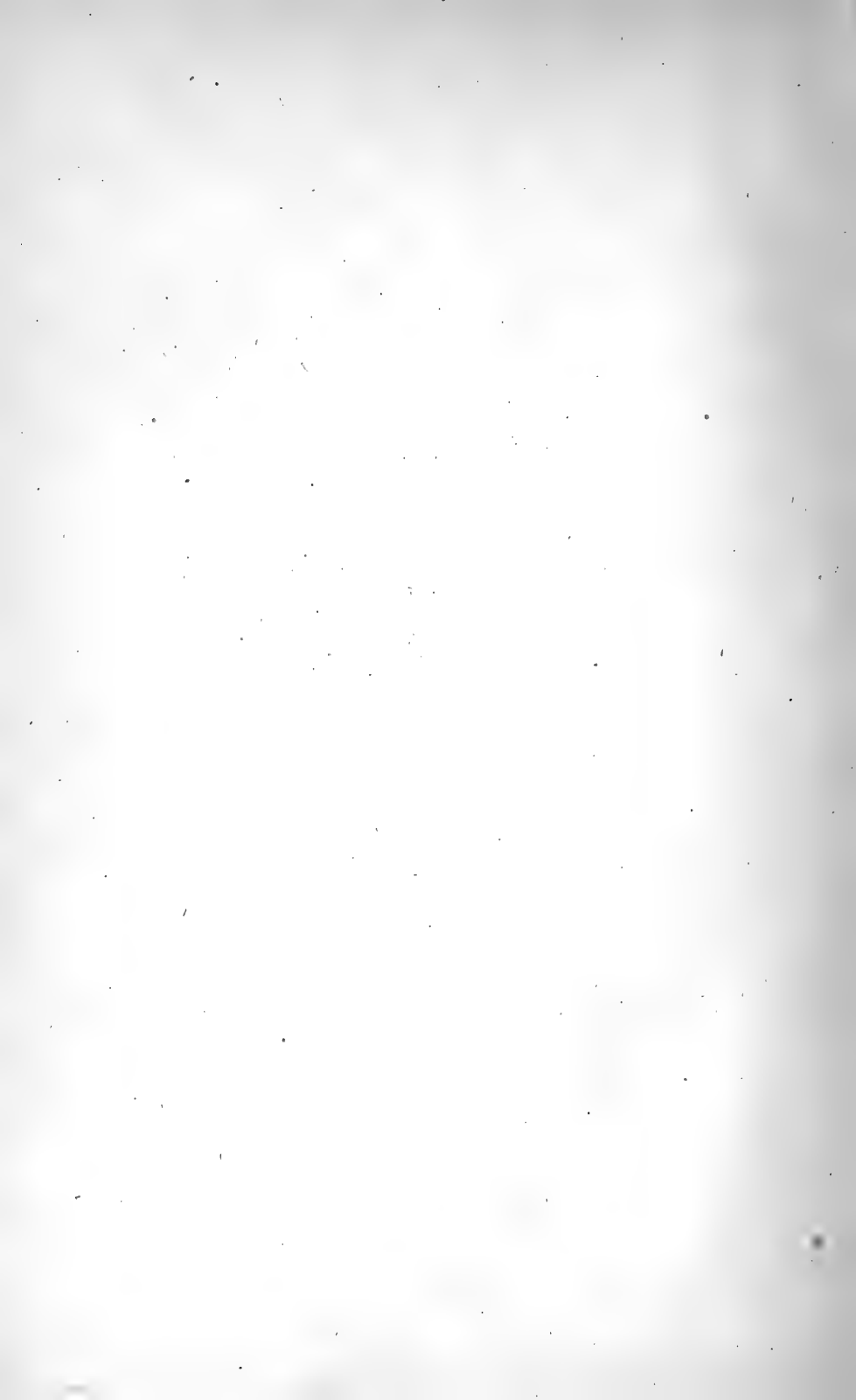
Fig. 1. *Helix picta*, Born. Jaw.

Fig. 2. The same, lingual membrane. *a*, central tooth.

Fig. 3. *Onchidium* (see p. 340). The central and adjacent lateral teeth of the lingual membrane, artificially separated.

Fig. 4. One separate tooth in profile.

Fig. 5. The same, a group of centrals and laterals as they occur naturally on the lingual membrane, magnified less than in figs. 3 and 4.







NOTES

ON

AMERICAN LAND SHELLS

AND OTHER

MISCELLANEOUS CONCHOLOGICAL CONTRIBUTIONS.

VOL. II. PART I.

BY

W. G. BINNEY.



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ON THE ANATOMY AND LINGUAL DENTITION OF *ARIOLIMAX* AND
OTHER PULMONATA.

BY W. G. BINNEY.

I have already, in connection with my friend Mr. T. Bland, given a description of the external characters of *Ariolimax* (Ann. N. Y. Lyc., N. H. X. 297, 1873). I now propose to describe such of its internal organs as I have been able to study.

I have examined one specimen of *Ariolimax niger*, J. G. Coop., preserved in spirit, belonging to the state collection of California, labelled and presented by Dr. Cooper, and in all respects an authentic type. Agreeing with this type I have other specimens from various California localities, so that I believe the species to be well established and generally distributed along the coast of California.

From the Museum of Comparative Zoology at Cambridge, Mr. Anthony has sent me a specimen, long preserved in alcohol, marked from San Mateo, California. For reasons given below, I am inclined to consider this the form described by Dr. Cooper as *A. Californicus*. I have had the opportunity of examining another specimen of this form, received from Mr. Stearns, who collected it near San Francisco.

From Mr. Henry Hemphill I have received a specimen from San Mateo Co., California, which presents most decided specific differences from the last-mentioned form, especially in its genitalia. Having considered the last-mentioned form as *A. Californicus*, I am forced to consider this as *A. Columbianus*, the only remaining described species. It must be borne in mind, however, that I have never compared it with specimens from more northern regions, whence the species was originally described. The large number of specimens formerly preserved in the Smithsonian, tabulated in Land and Fr. w. Shells, Part I. p. 281, were destroyed at the fire in Chicago, and I have been unable to obtain elsewhere any specimens from Oregon or Washington Territory, which I can refer to the true *Columbianus*.

In treating these various forms, I have abstained from giving any description of their exterior markings. Such description would be unreliable, as the specimens have been long preserved in

alcohol, and are evidently in various degrees of contraction. I will say, however, that I found in all the blind sac under the mouth (well marked, though not very deep), which is suspected by Dr. Leidy to be the seat of the olfactory nerve.

I can also here refer to several external characters not affected or obliterated by contraction in alcohol. All the specimens have a distinct locomotive disk to the foot. In all, the orifice of respiration is decidedly posterior to the middle of the right margin of the mantle. The position of the anus I found in *A. Columbianus* to be posterior and inferior to the respiratory orifice, with a gutter-like groove to the edge of the mantle. The position of the orifice of the generative organs is not so easily decided in alcoholic specimens. I have no doubt, however, that in the living animal it is under the mantle, not close behind the right tentacle. In one form, *Ariolimax Californicus*, there are beyond doubt two distinct orifices; that of the male being smaller and anterior. In Dr. Cooper's figure of *A. Californicus* (Proc. Phila. Ac. Nat. Sc. 1873, pl. iii. f. D 3) the two orifices are plainly shown, and suggested to me the identity of my specimens with his species, especially as the external markings also agreed with his description. In *A. Columbianus*? also there is no common duct or cloaca, as Dr. Leidy calls it, to the genitalia, though I could not detect more than one exterior orifice. In *A. niger* there can be but one common orifice, judging from the penis entering into the common cloaca, as shown in my fig. c of plate XI.

The mantle is free on its margin in its whole circumference, especially in front and on its sides as far back as the respiratory orifice. I could detect no concentric lines or other markings on the mantle. The mantle was greatly produced and swollen on its margins in Mr. Stearn's specimen of *A. Californicus*. In that and all the specimens examined I found an internal shell, varying somewhat in thickness, but always well marked, calcareous, subhexagonal, longer than wide. In the specimen of *A. Columbianus*? there were decided concentric lines of growth on the shell, as will be seen in my fig. a, plate II.

The caudal mucus pore was plainly visible in all the specimens of *A. niger* which I have examined. In fig. a of plate II. I have figured the pore of this species. It seems to be in two portions, one erect, triangular, at the end of the body of the animal, with another running at right angles with it in a gutter-like excava-

tion towards the extreme end of the tail. In the form I have referred to *A. Columbianus*? the pore was quite different from this, as seen in my figure B of plate II. In this the erect portion of the pore is entirely wanting, the carinated body being arched regularly down to, and overhanging the foot. The longitudinal gutter-like pore is, however, plainly visible. In the two specimens of the form I have referred to *A. Californicus*, the body is also arched down to, and overhangs, the foot. On the tail, corresponding to the gutter-like pore of the last-mentioned form, there was no sign of any pore, but in its place the flesh was sponge-like, without the markings which are found on the neighboring portions of the foot. It may be, therefore, that in these specimens the mucous pore was contracted or closed. No doubt it exists in the living animal.

Of the internal anatomy I have examined the nervous system in both *A. Californicus* and *A. Columbianus*?. The ganglia present the usual three sets, all globular in form, and so crowded together in the subœsophageal and superœsophageal as almost to form a continuous chain around the buccal mass.

In these same two forms, also, I have examined the circulatory and respiratory organs. Within the respiratory cavity is a large, spongy, ear-shaped organ, attached only at one point to the roof of the chamber. This, I suppose to be the renal organ, surrounding, and indeed inclosing, the heart, though it is not so arranged in any of the genera described by Dr. Leidy. In *Arion hortensis* he describes the nearest approach to such an arrangement.

I have examined the digestive system of all the forms, and figured that of both *A. Californicus* and *Columbianus*. In the latter, plate II. fig. D, F, the buccal mass (1) is large and round, the salivary glands (4) short and broad; the stomach (5) long and large, with a decided constriction at its middle, and the usual cul-de-sac (6) at its extremity, at which point the biliary ducts (7, 7) enter; from this the stomach passes into the intestine (8), which proceeds first forward almost to the œsophagus, thence proceeds backward to the extreme rear of the general cavity of the body, and again forward to below the respiratory cavity, into which it penetrates upwards as the rectum (9), and through which it passes to the anus, whose position is described above. The intestine in its whole course winds among, and is imbedded in, the

various lobes of the liver, which latter organ is arranged as usual in *Limax*, *Arion*, etc.

In *A. Californicus* (plate XI. fig. E), there is a difference in the arrangement of the stomach. Before reaching the cul-de-sac (6), the stomach is greatly constricted, and the cul-de-sac runs at right angles with the stomach in an erect position, not lying on its side as I have represented it, in order to show the connection between it and the anterior portion of the stomach, which connection was entirely concealed by the cul-de-sac in its upright position. The extreme length of the digestive system is three times that of the whole body of the animal, at least in its contracted state.

The jaw in all the forms of *Ariolimax* is quite thick, dark horn-colored, arcuate; ends but little attenuated, blunt; anterior surface with stout ribs, denticulating either margin. I have figured the jaw of *A. Columbianus*? (plate II. fig. H) which has about twelve ribs. In *A. Californicus*, from Mr. Anthony, there were thirteen ribs to the jaw; fourteen in Mr. Hemphill's specimen of the same. In *A. niger* Dr. Cooper describes about twenty, but in one specimen I found but eight. In Land and Fr. w. Shells, I. p. 280, I have figured a jaw of the true northern form with eighteen ribs.

The pouch of the lingual membrane is shown in plate II. fig. D, 5. The membrane is as usual in the *Helicidæ*, with tricuspid central, bicuspid lateral, and quadrate marginal teeth showing simply a modification of the laterals. In L. and Fr. w. Shells, I. p. 280, I have figured the lingual membrane of the true northern *A. Columbianus*. The marginal teeth are there shown to have one long denticle and a small, subobsolete side denticle. This form of marginal teeth I have found in the form I have referred to *A. Columbianus*? (see plate II. fig. E). Also in one of Dr. Cooper's types of *A. niger* (plate XI. fig. A), and in both the specimens of *A. Californicus* (plate XI. fig. G). This form of marginal tooth may therefore be considered characteristic of the genus, though in one specimen supposed to be *A. niger*, I noticed marginal teeth with the outer cusp much more developed and bifid, and figured them in Ann. Lyc. N. H. N. Y., x. pl. xiii. fig. 1. In plate XI. fig. B, I have given the central and the adjoining lateral teeth of *A. niger*. In fig. F, the central and one adjoining lateral of *A. Californicus*.

There is no retractor muscle to the buccal mass in *A. Califor-*

nicus and *A. Columbianus*?, but a very stout, broad one to the whole head, attached to the outer integument, below the buccal mass, and running along some distance on the floor of the general visceral cavity, to which finally it becomes attached.

In describing the genital organs I have used the terms applied to the various organs by Dr. Leidy in the first volume of my father's work on "The Terrestrial Mollusks of the United States." Each form examined presented differences in these organs. They all agree, however, in having a very large ovary.

On opening the body of *A. niger* (plate XI. fig. c), the genitalia are found in the usual place, the testicle lying quite at the rear of the visceral cavity near the extreme point of the upper lobes of the liver, hardly imbedded in it, connected to the ovary by a long epididymis (2). The testicle (1) is globular in form, composed of black, aciniform cæca. It contrasts in color with the dirty white of the liver. Color, however, I have not found constant in the internal organs of land shells preserved in spirits. The above described arrangement of the testicle is as usual in *Limax*, *Arion*, and other slugs. It forms an excellent specific character for *A. niger*, the position of the testicle being quite different in *A. Californicus* and *A. Columbianus*?, as will be seen below. The epididymis (2) is long, convoluted at the end nearer the ovary. The accessory gland is shown in 3. The ovary (11) is large, yellowish. The oviduct (8) and prostate (4) show no unusual characters. The genital bladder (9) is large, oval, with a short duct (16). The penis is in a short, stout sac (5), which has a bulb-like swelling at its upper extremity, where the vas deferens (7) enters. The latter organ has nothing of peculiar interest. A vaginal prostate, or perhaps dart sac, is shown in 13. The external orifice is described above (p. 34).

The genital system of *A. Californicus* is figured in D of plate XI. The testicle does not lie far away, imbedded in, or resting on, the upper lobes of the liver, but lies close against the ovary, in the semicircle formed by the recurving of the apex of the ovary upon itself. In this respect, the position of the testicle is different from that of most slugs, and affords an excellent specific character. The testicle (1) is kidney-shaped as it is covered by its investing membrane. It appears to consist of closely bound fasciculi of short, white, tubular, not aciniform cæca. The epididymis (2) is short and still more shortened by its excessive

convolution. The accessory gland is shown in 3, partially imbedded in the ovary. The ovary (11) is large and distinctly lobulated. The oviduct (8) is narrow, very long, greatly convoluted. From the testicle to about the middle of the course of the oviduct is a stout thread-like organ, of unknown use to me, either a muscle, nerve, or duct. It is not figured in my plate, as I am not certain of its forming part of the genital system. The genital bladder (9) is oval, large, with a short, stout duct (16). The penis is inclosed in a long tapering sac (5), terminating in a decided flagellum (15), in which I detected no capreolus. On the end of the flagellum is a large, globular bulb. The retractor muscle of the penis is attached to the roof of the general visceral cavity, below the pulmonary chamber. It joins the penis at the commencement of the flagellum. The vas deferens (7) is peculiar. It leaves the prostate gland (4) as usual, runs alongside of the vagina to the base of the penis, thence runs upwards, swelling to an enormous extent, so as to equal the breadth of the penis, then again becomes gradually reduced to its former size until, as the most delicate thread, it enters the penis at the end of the flagellum below the bulb. The penis did not appear in the animal extended as drawn in the plate, but was twice recurved upon itself. There is also a vaginal prostate (13), large, ear-shaped, close to the exterior orifice of the female organs, which, with that of the male, is described above (p. 34).

On plate II. fig. c, I have figured the genitalia of *A. Columbianus*? which also has a very large ovary (11) against which the testicle (1) lies as in the preceding form. The ovary is so large as to take up one-half of the entire visceral cavity, extending completely across the body, resting on the floor of the cavity, its ends recurved upwards so as to rest upon the liver on the upper surface of the viscera. The body of the animal externally is swollen by the large size of the ovary. The oviduct (8) is narrow, long, greatly convoluted, ending in an extremely long, convoluted vagina. The genital bladder (9) is oval, large, with a short, stout duct (16). The vas deferens (7) unlike that of the preceding form, is as usual in the land shells. It enters the penis (5) at its summit, opposite the retractor muscle (6). The sac of the penis is very stout, long, cylindrical. The external orifice is described above (p. 34).

Zonites lævigatus, Pfr., pl. III., fig. 1.

I have examined numerous specimens, but have some hesitation in giving my figure and description as absolutely perfect. I had great difficulty in dissecting the species.

The ovary is short and vagina long. The genital bladder with its duct forms a short cylindrical sac-like organ, opening near the base of the vagina, and tapering at the apex. The penis sac is long, cylindrical, larger at its apex where it receives the vas deferens. At its base the penis sac has its opening into the vagina with a short stout organ (fig. 13) with rounded apex, where a retractor muscle seems to be attached. This organ may be a dart sac or some form of prostate gland.

Hemphillia glandulosa, Bl. and Binn., pl. III., fig. v. vi.

The testicle is composed of a large globular mass of aciniform cæca. It lies loosely upon, not imbedded in, the upper lobes of the liver. The ovary and oviduct are as usual. The genital bladder is globular, very large, on a short stout duct, entering the vagina near its base. The penis sac is long, cylindrical, larger towards its apex, where both the retractor muscle and vas deferens enter.

In several specimens examined, the penis sac appeared somewhat different. It had a large globular bulb (5a) at its apex. The vas deferens (7) entered beyond the middle of the length of the sac (5); it was greatly swollen (5b) before entering the sac, for a distance equalling about one-half of the length of the sac. At the commencement of this swelling the retractor muscle (6) was inserted. This form of penis sac is figured in fig. VI.

The balance of the anatomy of *Hemphillia* seems to be as in the other slugs.

Helix Kelletti, Forbes (*Arionta*), pl. III., fig. iv. The Catalina Island form.

The ovary is light yellow. The oviduct is white. The genital bladder is light yellow. The prostate is large and yellow.

The whole genital system is long and narrow. The genital bladder is small, globular, on an extremely long and delicate duct which enters the vagina at its upper end. The duct just below the bladder receives a branch duct, very long, flagellate, three times the diameter of the duct itself. The penis sac is long, stout cylindrical, tapering towards its apex and prolonged into a very long delicate flagellum. The vas deferens enters at the point

where the flagellum commences. The retractor muscle is inserted half way between the vagina and the entrance of the vas deferens. Opposite the mouth of the penis sac is a small sac-like organ, probably a dart sac or vaginal prostate.

Helix Mitchelliana, Lea (*Mesodon*), pl. III., fig. III.

The genital system is long and narrow. The oviduct is greatly convoluted. The penis sac is long, stout, cylindrical, with a bulb-like expansion at its apex, at which point both vas deferens and retractor muscle are inserted. The genital bladder is lengthened, ovate, not much larger than its duct, which is short, and enters the vagina below the middle of its length.

Helix reticulata, Pfr. (*Arionta*), pl. III., fig. II.

The specimens examined have a very globose shell. The ovary is brownish below, yellowish above. The epididymis and testicle are salmon colored. The oviduct is white, the prostate salmon. The genital bladder is small, oval, with an extremely long duct, which has a flagellate branch. The duct enters at the lower end of the vagina. The penis is narrow, cylindrical, extremely long, with a flagellate extension. The retractor muscle is inserted beyond the middle of the length of the penis, the vas deferens at the commencement of the flagellum. There is a stout long cylindrical vaginal prostate, whose apex is extended into a flagellum, which shortly becomes bifurcate, there being a bulb-like expansion on each branch just beyond the bifurcation.

In some individuals the bulb-like expansions are still larger and stouter than in the figure. The cylindrical extension of the vaginal prostate is abruptly truncated, the two flagella entering near the end, not at the extreme terminus.

Helix Roemeri, Pfr. (*Mesodon*).

The genitalia are figured on pl. IV., fig. v. The oviduct is scarcely convoluted. The genital bladder is large, oval, with a long, large duct. The penis sac is short, stout, of about equal breadth throughout, ending in a stout oval bulb, into which the vas deferens enters. The retractor muscle is inserted above the entrance of the vas deferens.

The specimen examined was collected in Bosque County, Texas, by Mr. Hugo W. Ericsson.

Helix appressa, Say (*Triodopsis*).

The genitalia are figured on pl. IV., fig. iv. The ovary is long

and narrow. The epididymis is very long, convoluted at the end nearer the oviduct. The last-named organ is not much convoluted. The prostate is scalloped along its edges. The genital bladder is globular, small, with a long, small duct. The sac of the penis is extremely long, ribbon-like, one and one-half as long as the oviduct. The vas deferens enters its apex.

The long ribbon-like sac of the penis resembles that figured by Dr. Leidy (Terr. Moll. U. S. I.), of *H. Sayii*. There is but little resemblance to the genitalia of *H. palliata*, so nearly allied by its shell.

The specimens examined were collected in eastern Tennessee, by Miss Law.

***Helix Nickliniana*, Lea (*Arionta*).**

The genitalia are figured on plate IV. fig. III. The ovary is yellow, long, narrow, concave on one side, convex and carinated on the other. The accessory gland of the epididymis is composed of long, white cæca. The oviduct is extremely long, narrow, convoluted. The genital bladder is globular, small, with an extremely long duct, to which is added an accessory duct or branch, almost as long as the oviduct. This branch joins the duct near its end. It is thicker than the duct. The duct enters the vagina at its upper part. The penis sac is long, cylindrical, small, almost equalling in length the oviduct and ovary united. The retractor muscle is inserted at about the middle of its length, it is attached to the diaphragm; the vas deferens enters about three-fourths of its length; beyond the vas deferens is a flagellate extension. The vagina is long and narrow; near its base, opposite the entrance of the sac of the penis is a stout, cylindrical, long, hollow, vaginal prostate, gradually tapering at its apex, and extended into a delicate tube, which soon becomes divided into two long flagella. Just beyond the division, on each flagellum, is a stout bulb-like enlargement.

This complicated form of genitalia, hitherto unnoticed in American species, has been noticed in European species.

***Patula strigosa*, Gould, pl. IV., fig. II.**

Represents the genitalia of a Salmon River specimen. The testicle, as usual, was in the summit of the upper lobe of the liver. The epididymis is long, convoluted in its half nearer the testicle. The accessory gland is composed of several long, black cæca. The oviduct is sac-like, not convoluted, containing eight embryonic

shells. The genital bladder is long, with a long, narrow duct entering the upper part of the vagina. The vagina is short and swollen. The penis sac is long, stout, blunt at apex, where the retractor muscle is inserted. The vas deferens becomes greatly swollen before it enters the sac of the penis, which it does above the insertion of the retractor muscle.

As the shells of some forms of this species are difficult to distinguish from some forms of *Patula solitaria*, it is interesting to state that the genitalia of a specimen of the latter from the same locality, offer very distinct specific characteristics, agreeing with Dr. Leidy's figure in Terr. Moll. U. S. I.

Macrocyclus Vancouverensis, Lea.

The genitalia are figured on pl. IV., fig. 1. The epididymis is extremely long and very large, forming the peculiar feature of the system. The genital bladder is oval, with a long duct, which is very much broader at the end nearer the vagina. The penis sac is long, gradually tapering at its apex, where it receives the vas deferens. Upon the side of the vagina, about the middle of its length, is a wart-like protuberance, which may be a dart sac or a vaginal prostate.

A comparison of Dr. Leidy's figure of the genitalia of *M. concava* in Terr. Moll. U. S. I. shows considerable difference between the two species, especially in the epididymis.

Zonites demissus, Binney.

The genitalia are like those of *Z. intertextus*, Binney, figured by Dr. Leidy (Terr. Moll. U. S. I.). The accessory glands of the dart sac are rather shorter in *demissus*.

Amphibulima appendiculata, Pfr.

Elsewhere (Ann. Lyc. Nat. Hist., N. Y. x. 206, pl. ix. f. 2, 6, 9, 11) we have fully described the external appearance, jaw, lingual membrane, and shell of this species, pointing out its differences from *Succinea*, from *Pellicula*, from *Omalonyx*, and all other described genera.

I now give (pl. VIII. fig. 5) a figure of its genital system, with notes on other organs, *drawn from specimens in alcohol*.

The external orifice of generation is behind the right eyepeduncle. The orifice of respiration is on the right margin of the mantle, slightly to the rear of its middle. There is a distinct locomotive disk to the foot. The eyepeduncles must be short and stout. The digestive and nervous systems present no remarkable feature.

The subœsophageal ganglia consist apparently of six closely agglomerated globules. There are two simple globules to the stomacogastric ganglia. The genital system (pl. VIII. fig. 5) is quite simple, presenting no accessory organs. The testicle is composed of six or seven fasciculi of long cæca, which massed together in a globular form equal the length of the oviduct. This enormous development of the testicle is the peculiarity of the genital system, and no doubt will prove a reliable specific, but not generic, character. The epididymis is long, convoluted at its middle portion. The oviduct is long, narrow, not convoluted. The vagina is about one-fifth the length of the oviduct; it is swollen greatly at the entrance of the penis. The genital bladder is small, globular; its duct is narrow, longer than the oviduct, and enters the vagina at the upper fourth of its length. The penis sac is short, stout, blunt at apex, where the vas deferens enters and where the retractor muscle is also inserted.

In the paper referred to above we hesitated to decide upon the generic position of this species, leaving it temporarily in *Pellicula* of Fischer (not of Heynemann, which is *Omalonyx*). Since that time I have become acquainted with the jaw of *Amphibulima*, and find it to be of the same type as in *appendiculata*. I would, therefore, suggest that this species belongs to *Amphibulima*. It is true its lingual dentition (see pl. VIII. fig. 6) more closely resembles that of *Simpulopsis sulculosa* as far as centrals, and perhaps laterals, are concerned; but in the marginals, as described in *S. sulculosa* and *S. Portoricensis*, the resemblance ceases. Moreover, the jaw of *Simpulopsis* is described as quite different by Shuttleworth. The species under consideration cannot, therefore, be placed in *Simpulopsis*. It appears, at all events, that the shell in this group is an unreliable guide to generic position.

It must be borne in mind that I here describe the anatomy of the shell figured by us (l.c.). We believe it to be *Succinea appendiculata*, Pfr. Fischer bases his genus *Pellicula* on *Succinea depressa*, Rang. He does, indeed, place *S. appendiculata*, Pfr., in the synonymy of his species, but our specimens of *appendiculata* could never be the same as Fischer's specimens of *depressa*. His had a jaw with nine decided ribs, denticulating the cutting edge, and teeth¹ of the usual form of *Helicinæ*, quite different from what

¹ In Fischer's plate the references to teeth of *Omalonyx unguis* and *Pellicula depressa* are reversed.

we find in our *S. appendiculata*. His species and ours are therefore distinct.

Pellicula convexa, Martens (*Succinea*), is quite a distinct species, and belongs to the genus *Omalonyx*, as shown by Heynemann's figure of the jaw (Mal. Blatt., xv.).

I give also figures of the central and lateral teeth of our species (pl. VIII., fig. 6).

***Amphibulima patula*, Brug.**

I have elsewhere described, in connection with Mr. Bland, the jaw and lingual membrane of specimens of this species from St. Kitts and Dominica (Am. Journ. of Conch., VII. 186, pl. xvii., f. 1, 2; Ann. Lyc. N. H. and N. Y., x. 225, pl. xi., f. 8). Lately the question of identity of these shells with the Guadeloupe *patula* has been raised (see Journal de Conchyliologie, XXI. 12). I have, therefore, again carefully examined the lingual membranes previously described to learn if they give any difference worthy to be considered of specific value. I have figured teeth from each lingual membrane (pl. VII.). I regret not having had the opportunity of examining Guadeloupe specimens also, but have never been able to receive the latter with the animal; indeed it seems to be now found subfossil only. I can only treat the question of the identity of the St. Kitts and Dominica forms, not their identity with Guadeloupe forms.

It will be seen that the Dominica form has sharper cutting points to the large cusps of its central and lateral teeth than that of St. Kitts. Fig. B shows a group of laterals of the former, in which some variation from the pointed shape is indeed shown, but no decided tendency that way. On the other hand, the laterals, from the St. Kitts form, show great constancy in the square truncation of the cutting points.

The teeth of the St. Kitts form are broader in proportion to their length than those of Dominica, have a greater curve in their outlines, and more developed side cusps, which overlap the median cusps.

The Dominica lingual in the only row counted had 87-1-87 teeth. A row of the St. Kitts form 57-1-57. The marginal teeth of the St. Kitts form show a greater tendency to splitting into sharp denticles on the cutting cusps than those of Dominica.

It cannot be denied that certain variations may be noticed in the two lingual membranes. I believe, however, that these differ-

ences are not such as suggest specific distinction, especially as the shell furnishes no grounds for doubting the specific identity of the forms. Nor by the shell alone does there seem to be two species.

Mr. Bland has given a detailed account of the species in *Journal de Conchyliologie*, XXI. 342, October, 1873.

Amphibulima rubescens, Desh.

Mr. Bland and myself are indebted to Governor Rawson for specimens preserved in spirits of *Succinea rubescens*, Fér. of Martinique.

On examination of the jaw and lingual membrane, I found the species to be no *Succinea*, but an *Amphibulima*, in which genus it is placed by H. and A. Adams (Gen. Rec. Moll.), and by Beck (Index), though Pfeiffer treats it as a *Succinea*, and von Martens catalogues it in *Succinea*, s. str. (See note 1 to p. 345 of *Journ. de Conch.*, Oct. 1873, 3d series, XIII.)

The external appearance of the animal has nothing peculiar. The head appears blunt and short, the tail long and pointed, without any mucus pore. There is no distinctly marked locomotive disk to the foot, over the whole breadth of which the transverse muscles pass. The reticulations of the surface of the animal seem large and coarse in proportion to its size. As far as can be judged from alcoholic specimens, the tentacles and eyepeduncles seem short and stout. The respiratory and anal orifices are under the mantle on the right side. The external orifice of generation is behind the right eyepeduncle.

On opening the animal from above, the generative system is found as usual, lying on the right of the animal. It occupies the whole of the visceral cavity in front of the shell, lying upon the stomach. The testicle (see plate VIII., fig. 4) is a globular mass composed of long cæca. It lies imbedded in the liver. The epididymis is not greatly convoluted. It passes between the stomach and intestine, at the cul-de-sac of the former, on its way to the ovary. The latter organ is, as usual, tongue-shaped. The oviduct is long and greatly convoluted. The vagina is short, receiving at its lower portion the long duct of the small, globular genital bladder. The penis enters the vagina close to the common opening. The sac of the penis is not long, is stout, cylindrical, blunt at apex, where it receives the vas deferens, just above the insertion of the retractor muscle. There are no accessory organs. The genital system is very much the same in its general arrange-

ment as that of *Amphibulima appendiculata*, Pfr. (see fig. 5), but differs among other things in wanting the huge testicle of that species.

The digestive system presents no peculiar characters. The stomach is long, narrow, and ribbon-shaped, lying under the genital system and extending backward as far as the shell when the animal is extended. At this point the stomach forms the usual cul-de-sac at its junction with the intestine. The last organ and the liver are small in proportion, as would be anticipated from the short spire of the shell; the liver is dark blue. There seems to be a retractor muscle to the whole head rather than to the buccal mass. It lies on the floor of the cavity. The buccal mass is large, the œsophagus small. The salivary glands and ducts, and pouch of the lingual membrane are as usual. The jaw is readily detached from the muscles of the mouth, and is not connected with the lingual membrane as usual with our *Helices*.¹ It is thin, wide, low, arched, with attenuated, bluntly pointed ends; divided by numerous (about 63) delicate ribs into separate plate-like divisions, as in the jaw of *Cylindrella*, *Bulimulus*, etc., the ribs running somewhat obliquely towards the centre of the jaw; there is no decided, upper median, triangular plate (fig. 2, plate VIII.). The lingual membrane (plate VII., fig. 3) is long, broad, composed of numerous rows of 76-1-76 teeth. Centrals long, narrow, expanding below with the lower margin squarely excavated as in *Succinea*; tricuspid, the central cusp very long, wide, with a greatly expanded, squarely truncated cutting point reaching beyond the lower margin of the tooth; the side cusps short and narrow, simply pointed. The lateral teeth are of same type as the centrals, but unsymmetrical and bicuspid. The marginals are a simple modification of the laterals, with a long, bluntly truncated median cusp, and obsolete side cusps. The extreme marginals are irregularly denticulated, the outer and inner denticles being more produced, especially the outer, and greatly curved; the inner denticles, usually two in number, are quite small.

The jaw agrees perfectly with that of the genus *Amphibulima* described by us. (Ann. Lyc. N. H. of N. Y., x. p. 223, pl. xi.

¹ Even after boiling the whole buccal mass in potash, the lingual membrane and jaw remain attached in most of our *Helices* of N. A. showing a decided connection between the two.

fig. 8.) The lingual membrane has also the same general arrangement as in that genus, with specific differences from that of *A. patula* (see plate VII., fig. A-C), especially in the widely expanded, blunt median cusp, and in the *Succinea*-like cutting away of the lower margin of the teeth.

The nervous ganglia are as usual in the *Geophila*, forming a continuous ring in the supraesophageal, and grouped together in one mass in the subesophageal set.

Plate VIII., fig. 3, gives the central and adjacent lateral teeth, with marginals at different intervals to the edge of the membrane.

The notes we have given above will enable a full generic description of the genus *Amphibulima* to be drawn.

Gonospira and **Nanina**, from Mauritius.

Having received from the Museum of Comparative Zoology at Cambridge a number of specimens in alcohol of Mauritius species, collected by Consul Pike, we are able to give the following notes on them.

Gonospira. There were several species of this and the allied subgenera, allowing an examination of their anatomy. The soft parts of the animals are colored red. The species especially examined are *G. Newtoni*, H. Ad., and *G. palanga*, Fér. There seems nothing in the anatomy different from what is usual in the land shells. The genitalia of *G. Newtoni* are figured on plate VIII., fig. 7. There are no accessory organs. The genital bladder is long, oval, with a long, narrow duct. The penis sac is stout, long, receiving the vas deferens at its summit, at which point, also, the retractor muscle is inserted. The vagina is long, the oviduct not convoluted. The ovary tongue-shaped as usual. The epididymis is short, the testicle as usual lies in the liver.

G. palanga has a similar genital system. There appears no locomotive disk and no caudal pore.

The lingual membrane of the genus has been photographed by Mr. Bland and myself (Am. Journ. of Conch., v. pl. xi. fig. 1). All the species now received have similar dentition. There is, however, a difference in the number of teeth in each transverse row. I counted about 37-1-37 in *palanga*; 6-1-6 in *G. Newtoni*; 12-1-12 in *G. mauritiana*, Morelet; 25-1-25 in *G. modiolus*, Fér. (*Gibbulina*, v. Martens). The dentition of this species is also described by Semper (Nachr. Mal. Ges., II. 103). 21-1-21 in *G.*

Nevilli. We have elsewhere described the dentition of *G. sulcata*, Müll. (Ann. N. Y. Lyc. N. H., x. 222).

No jaw was found in any of the above, nor in *Ennea clavulata*, Lam. This last species is placed in s. g. *Gulella* by von Martens. There were five embryonic shells in the oviduct, proving the species to be viviparous. The dentition is the same as in *Gonospira*. There appears to be a median tooth of same form as the laterals.

Of the genus *Nanina* (using the name in the same sense as von Martens in die Heliceen), there were several species. All have the locomotive disk, the caudal pore with overhanging horn-like projection, the smooth jaw with median projection, and the lingual dentition of the genus, *i. e.*, centrals tricuspid, laterals bicuspid, marginals aculeate, bluntly bifid. Such are *N. Caldwelli*, Benson; *N. Rawsoni*, Barclay = *semicerina*, Morelet; *N. argentea*, Rve.; *N. implicata*, Nevill; *N. stylodon*, Pfr., put in *Helix (Erepta)* by von Martens. Entirely different in the dentition is another species, *N. philyrina*, Morelet, though the species agrees in other respects with the above-named. The membrane is very broad, the teeth exceedingly numerous, arranged in oblique rows. The centrals, which I am confident of having seen, are small, narrow, high. The other teeth are the same in form to the edge of the membrane. They appear to have the usual aculeate form of the marginal teeth in *Nanina*, but instead of narrowing towards the cutting point, they are broadly and obliquely truncated, reflected, and minutely denticulated. This lingual membrane is also figured by Semper (Phil. Archip., pl. vi. f. 35), but his figures give more the impression of the usual *Nanina* marginals with denticulated side and bifid points. The teeth are, however, so exceedingly numerous and small, it is very difficult to understand them.

Elsewhere (Ann. N. Y. Lyc. N. H., x. 170) we have described the lingual of the following Mauritius species: *Nanina inversicolor*, *leucostyla*, *rufizonata*, *militaris*. I have examined the genitalia of *N. inversicolor*. The oviduct is long, narrow, sac-like; the genital bladder is hardly smaller than its long wide duct; the penis sac is long, extended into a flagellum, receiving the vas deferens near its apex, beyond it having a bulb-like termination; the vas deferens is greatly swollen at its middle portion, and near the base of the oviduct has a long flagellate appendix.

Glandina semitarum, Rang. (*Varicella*).

Martinique, Governor Rawson.

Lingual membrane as usual in *Glandina*. There are about 30–1–30 teeth. The central is long and narrow, sharply pointed.

Glandina Phillipsi, Adams (*Varicella*).

Jamaica.

Lingual membrane as in last species.

Helix clausa, Say (*Mesodon*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw as usual in the subgenus, with about 10 stout, separate ribs, denticulating either margin.

Lingual membrane long and narrow. Teeth about 41–1–41. Centrals and laterals (about 11 of the latter), as usual in the subgenus (see fig. of those of *H. Sayi*, L. and Fr. w. Shells, I. 154, fig. 265). Marginals quadrate, with one extremely long, oblique denticle, as in *H. thyroides* (l. c. fig. 252, p. 148). Some of the extreme marginals are notched or obsoletely bifid at their point.

The penis resembles that of *H. thyroides* as figured by Dr. Leidy in Terr. Moll. U. S., I.

Helix Downieana, Bland (*Mesodon*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw ribbed as usual in the subgenus. Lingual membrane as usual in the subgenus (see fig. 265 of L. and Fr. w. Shells, N. A., I). Marginals with one long, oblique, bluntly bifid inner denticle, and two short, blunt outer denticles.

Helix Wetherbyi, Bland (*Mesodon*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw and lingual membrane as usual in the subgenus (see *ante*, *H. clausa*), the former with about 18 ribs, the latter with marginals peculiar for the great development of the inner blunt denticle, the outer being short and blunt. Plate V., fig. 17, 18.

Helix Edwardsi, Bland (*Stenotrema*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw as usual in the subgenus (see L. and Fr. w. Shells, N. A., I), with about 13 broad, crowded ribs, denticulating either margin.

Lingual membrane as in *H. hirsuta* (l. c. 119, fig. 197). Centrals tricuspid, laterals bicuspid, marginals wide, low, with one

inner, long, oblique, bluntly bifid denticle, and two outer, short, blunt denticles.

Helix angulata, Fér. (*Eurycratera*).

Porto Rico. From the late Mr. Robert Swift.

Jaw stout, dark claret-colored, low, wide, ends blunt; about 7, very wide, crowded, decided ribs, bluntly denticulating either margin.

Lingual membrane as in the *H. crispata* (plate X., fig. 9), as far as the general arrangement of the teeth, but there are decidedly developed points to the side cusps of both centrals and laterals; we have therefore figured it (plate IX., fig. 5).

Helix Texasiana, Mor. (*Polygyra*).

Bosque Co., Texas. Mr. H. W. Ericsson.

Jaw wide, low, slightly arcuate, ends blunt, with 10 decided ribs, denticulating either margin.

Lingual membrane (plate V., fig. 1) as usual in the subgenus. Centrals and laterals with a plate about as wide as high, the former tricuspid, the latter bicuspid, cusps long and slender, with long, sharp points. Marginals low, wide, multidentate, the two inner denticles long, the several outer denticles short and slender. Of the same type as figured by us for *H. auriculata* in L. and Fr. w. Shells, I. 87.

Helix Luquillensis, Shuttl. (*Polydotes*).

The lingual was received mounted from the late Mr. Robert Swift.

Lingual membrane (plate X., fig. 2-4) as usual in the *Helicidae*. Centrals tricuspid, laterals bicuspid, cusps with long, sharp points, extending beyond the base of the plate. Marginals bicuspid, cusps short, bluntly rounded, the inner one, as usual, the longer.

We received no jaw of this species.

Helix notabilis, Shuttl. (*Thelidomus*).

Tortola. Received mounted from the late Mr. Robert Swift.

Jaw arcuate, low, ends blunt; narrower at the centre; decided separate ribs, denticulating either margin.

Lingual membrane already published by us. (Am. Journ. Conch., VI. 177; see also plate IX., fig. 10). Centrals tricuspid, laterals bicuspid, the plates about as wide as high, the larger cusp with a long point extending beyond the lower margin of the

plate. Marginals quadrate, of equal width and height, with two short, wide, blunt, round cusps, the inner one slightly the larger.

Helix discolor, Fér. (*Thelidomus*).

Jaw arcuate, thick, ends blunt. Anterior surface with 7 unequal, decided, stout ribs, denticulating either margin.

Lingual membrane (plate X., fig. 1) long and narrow. Centrals with a long narrow plate expanded at the base, and bearing at its corners a small reinforcement; base of the plate extending beyond the cusp; bluntly tricuspid, the median cusp long, stout, with a short blunt point; side cusps subobsolete. Laterals as in the centrals, but unsymmetrical, and with a shorter plate. Marginals quadrate, wide as high, with two short, blunt denticles, the inner one slightly the longer.

Helix lima, Fér. (*Thelidomus*).

Porto Rico. Received mounted from the late Mr. Robert Swift.

Jaw arcuate, thick, high, ends blunt; no median projection to the cutting edge. Anterior surface with 7 stout ribs. A strong, thick muscular attachment to the upper margin.

No lingual membrane received.

Helix marginella, Gmel. (*Caracollus*).

Porto Rico. Received mounted from the late Mr. Robert Swift.

A portion only of the jaw is preserved on the slide. It appears to be thick, arcuate, with strong transverse lines of reinforcement and decided ribs.

Lingual dentition as in *H. excellens* (see plate X., fig. 67).

Helix Chemnitziana, Pfr. (*Pleurodonta*).

Jamaica. Received mounted from the late Mr. Robert Swift.

Jaw stout, arched, ends attenuated, blunt; anterior surface with about 6 irregularly disposed ribs, stout and denticulating either margin.

No lingual membrane received.

Helix Carmelita, Fér. (*Pleurodonta*).

Jamaica. Received mounted from the late Mr. Robert Swift.

Jaw arcuate, ends blunt, anterior surface with about 6 stout ribs, denticulating either margin.

Lingual membrane (plate X., fig. 5) as usual in the *Helicidæ*. Central teeth short, bluntly pointed on the middle cusps, the side cusps subobsolete; laterals like centrals, also with obsolete

side cusps; marginals with oblique bluntly rounded broad cusps, the inner, larger, one bluntly bifid.

Helix punctata (*nux denticulata*), Born. (*Dentellaria*).

Martinique. Governor Rawson.

Jaw stout, arched, ends blunt, cutting edge with a blunt median projection, one stout, decided rib on the centre of the jaw, and three less developed separate ribs at each side of it.

Lingual membrane long and narrow (plate IX., fig. 8). Centrals high and narrow with long, stout median cusps, bearing a point extending nearly to the base of the plate; side cusps subobsolete. Laterals like the centrals, but unsymmetrical. Marginals low, wide, subquadrate, with one very long, broad, bluntly bifid, oblique denticle, and one smaller, bluntly rounded, side denticle.

Helix nucleola, Rang. (*Dentellaria*).

Martinique. Governor Rawson.

Jaw thick, arched, ends blunt; cutting margin with an obtuse median projection. One central, stout rib, denticulating either margin.

Lingual membrane, as usual in *Dentellaria* (see *H. punctata*, Born), above.

Helix formosa, Fér. (*Dentellaria*).

Antigua. Received mounted from the late Mr. Robert Swift.

Jaw arched; ends blunt; several strong, transverse lines of reinforcement, but no ribs; a median projection to cutting edge.

Lingual membrane as usual in the subgenus. (See pl. IX., fig. 8, of *punctata*, Born.)

Helix badia, Fér. (*Dentellaria*).

Received mounted from Mr. Swift.

Jaw stout, arched; ends blunt, with about eight decided ribs.

Lingual membrane as usual in the subgenus. (See pl. IX., fig. 8, of *H. punctata*, Born.)

Pupa rupicola, Say.

Ohio. A. G. Wetherby.

Jaw low, wide, slightly arcuate; ends but little attenuated, blunt; no median projection to cutting edge.

Lingual membrane as usual in the genus. (See figures of that of *corticaria*, *pentodon*, and *badia* in L. & Fr. w. N. A., I.) The cusps on the laterals, however, are very much stouter. There are five perfect laterals.

***Strophia decumana*, Fér.**

Castle Island, Bahamas.

On pl. VIII., fig. 1, will be found figures of the dentition of this species. For full description, see *Annals of Lyc. Nat. Hist. of N. Y.*, x., p. 348.

***Bulimulus chrysalis*, Pfr.**

Martinique. Gov. Rawson.

Jaw of the type common in *Bulimulus*, *Cylindrella*, etc., arcuate, low; ends blunt; thin, transparent; with eighteen narrow, separated ribs; a transverse central line of reinforcement. Attached to the upper margin is a strong triangular membrane of the same consistency and material as the jaw itself, and equally resisting the action of potash, so as readily to be mistaken for the accessory plate of the *Succineæ*. (Pl. V., fig. 11.)

Lingual membrane (pl. V. fig. 12, 13) as usual in the *Helicinæ*. Centrals about as broad as long, tricuspid, the median cusp short and stout, its short point not extending to the base of the plate. Laterals like the centrals, but bicuspid. Marginals wide, low, with one inner, long, blunt, stout, oblique denticle, and one or two short, blunt side denticles.

***Bulimulus Vincentimus*, Pfr., var. ? (*Drymaeus*).**

Tobago. Jaw as usual in *Bulimulus*, *Cylindrella*, etc., thin, transparent, with numerous delicate, separated, narrow ribs.

Lingual membrane as in *Bulimulus taticinctus*, etc. (see *Ann. N. Y. Lyc.*, x. pl. xi., fig. 1.)

***Bulimulus Knorri*, Pfr. (*Drymaeus*).**

Porto Cabello, Venezuela. Received mounted from the late Mr. Robert Swift.

Jaw arched, high, ends attenuated, blunt; an obtuse median projection to cutting edge; transverse lines of reinforcement, but no ribs.

An unusual form of jaw in this genus, though common in many subgenera of *Helix*.

***Bulimulus Peruvianus*, Brug. (*Plectostylus*).**

Talcahuana. Museum Comparative Zoology.

Jaw as in *Cylindrella*, etc., with about thirty delicate ribs; upper central plate triangular.

Lingual membrane (pl. V., fig. 2) combining the usual characters of the genus with those peculiar to the group of *B. taticinctus*

(referred to above under *B. Vincentinus*). The central tooth is higher than wide, tricuspid, the central cusp short, not extending near the base of the tooth. The laterals (5 in number) are bicuspid, the inner cusp with short, subcircular cutting edge. Marginals of the type of *B. laticinctus* (l. c.).

Bulimus (*Pachyotus*) **egregius**, Jay.

Brazil. J. G. Anthony.

No jaw received.

Lingual membrane as usual in the *Helicidæ*. Centrals and laterals higher than wide, the plates almost extending to the point of the cusps; central with a large median and small side cusps; lateral bicuspid, the inner cusp very large, and bluntly pointed, the outer cusp very small, and acutely pointed. Marginals quadrate, about as high as wide, with one wide, very short, blunt inner cusp, and a similar small outer cusp. (Pl. VI., fig. 1.)

Succinea Barbadosis, Guild.

Barbados. Jaw and lingual membrane as usual in the genus.

Lithotis rupicola, Blanford.

Figs. 3-6 of plate V. represent the jaw and lingual dentition of this species, which are fully described in Ann. Lyc. Nat. Hist. N. Y., x. 346.

Erinna Newcombi, A. Adams.

Sandwich Islands.

Figs. 7-10 of plate V. represent the jaw and lingual dentition of this species, which have been fully described in Ann. of N. Y. Lyc. of Nat. Hist., x. p. 349.

Before closing this paper, I propose reviewing my work on lingual dentition and jaws, for the purpose of ascertaining what reliance may be placed on their characters as a basis for subgeneric distinction, in the genera *Helix* and *Bulimus*. Of *Bulimulus* we cannot yet speak with confidence, so poor is our material.

Sagda.—The genus is included in the *Vitrinea* of von Martens, but we have shown that it belongs to the *Helicea*, the marginal teeth being quadrate, not aculeate.

The jaw has no anterior ribs. In *H. Jayana* there is an approach to a median projection to the cutting edge, but not in *Haldemani* or *Foremaniana*.

The lingual membrane we have examined in *connectens*, *Jayana*,

and *Haldemaniana*. We figure that of the latter (plate IX., fig. 4), with which the others agree. The centrals have their plates short in comparison to the reflection, and broad. The middle cusp is long, with a long slender point. The side cusps are subobsolete, with short, acute, triangular points. The laterals are of same type as centrals, but bicuspid, the outer cusp more developed than the external cusps of the centrals. The marginals are wide, low, with one long, oblique, blunt, narrow inner cusp, and one or more side, small cusps. The dentition and jaw of this species are fully described in Am. Journ. Conch., VII. 175; *S. connectens* in Ibid. 175; *S. Jayana* in Ann. N. Y. Lyc., x. 219.

Leucochroa.—We have shown *L. Boissieri*, Charp., to belong to *Helicea* and not to *Vitrinea*, and expressed our belief that the same will prove true of *candidissima*. (See Ann. N. Y. Lyc., x. 220.) We now figure the dentition (plate IX., fig. 3). The jaw is ribless, with a median projection.

Microphysa is put in *Helicea* by von Martens. *H. minuscula* (see L. and Fr. w. Shells) and *circumfirmata*, Redf. (N. Y. Ann., x. 231), both belong to *Vitrinea*, having aculeate marginal teeth, and jaw of *Zonites*. *H. turbiniformis*, Pfr. (Ann. N. Y. Lyc., x. 79, pl. ii. fig. 2) has a jaw as in *Cylindrella*, *Bulinulus*, etc.—*i. e.* with numerous very delicate, distant ribs, giving the appearance of separate plates. It would be put in *Goniognatha* of Morch, though there are no upper triangular median plates. We here figure the lingual dentition (plate IX., fig. 7).

For *Patula*, *Gonostoma*, *Polygyra*, *Polygyrella*, *Stenotrema*, *Triodopsis*, *Mesodon*, *Acanthinula*, *Vallonia*, *Aglaja*, *Arionta*, *Euparypha*, *Tachea*, *Pomatia*, *Glyptostoma*, see L. and Fr. w. Shells N. A., I., and our various papers on dentition.

Dorcasia is known to us only by one species, *H. similis*, Fér. (see Am. Journ. Conch., VII. 176). The jaw has eight decided ribs. I figure the lingual dentition (plate IX., fig. 6).

Fruticicola is known to us only by *H. griseola*, Pfr. (see Proc. Phila. Ac. N. S. 1873, 243). The dentition I now figure (plate X., fig. 11).

Coryda.—We have described the lingual membrane only of this subgenus, and that in only one species, *H. Gossei*, Pfr. (Am. Journ. Conch., VII. 177). We figure it on plate IX., fig. 2. The centrals have long, narrow plates, a very short reflection, with a short, blunt median cusp and obsolete side cusps. Laterals like

centrals, but unsymmetrical. Marginals quadrate, with one broad, oblique, long, bluntly bifid inner cusp, and one or two very short rounded side cusps.

Thelidomus.—We have examined *H. aspera*, Fér. (Am. Journ. Conch., VI. 204); *discolor*, Fér. (ante, p. 51); *notabilis*, Shutt. (Amer. Journ. Conch., VII. 177); *lima*, Fér. (ante, p. 51); and *provisoria*, Pfr. (Ann. Lyc. N. Y., x. 347).

There are 8 decided stout ribs on the jaw of *aspera*, 7 on that of *discolor* and *lima*, on *provisoria* we find 10–15 ribs, less decided than in the other two species.

I figure the lingual dentition of *H. discolor* (plate X., fig. 1). *H. aspera* agrees with it. The marginal teeth of *provisoria* and *notabilis* agree with those of *aspera* and *discolor*, but as the centrals and laterals differ in the shape of the plates and the development of the cusps, I also figure the central and lateral of *notabilis* (plate IX., fig. 10), with which *provisoria* agrees.

Cysticopsis we know by *tumida*, Pfr., and *pemphigodes*, Pfr. For description and figure of the former see Ann. N. Y. Lyc. N. H., IX. 213, f. 3; Am. Journ. Conch., VI. 203, f. 1. Finding the dentition of *pemphigodes* to be different (Am. Journ. Conch., VII. 177) I here figure it (plate IX., fig. 1).

Plagiptycha.—We have published *H. loxodon*, Pfr., *Albersiana*, Pfr., *monodonta*, Lea, *diaphana*, Lea, and *macroglossa*. (See Am. Journ. Conch., VII. 177, 178.) They all agree in having a ribless jaw with blunt median projection to cutting edge, and in dentition such as I figure for *H. macroglossa*, Pfr. (plate X., fig. 10).

Polymita.—We have elsewhere (Ann. N. Y. Lyc., x. 341) pointed out the necessity of revising this subgenus. The typical species *muscarum*, and *H. picta* which must be removed to it from *Liochila*, have a ribless jaw without median projection to the cutting margin (see Am. Journ. Conch., VI. 204, pl. IX., f. 4, 10). The lingual dentition of both species agrees (see *ibid.* and Ann. N. Y. Lyc., x. pl. xvi. fig. 14). It is entirely different from that of any species now known.

Hemitrochus must be used as the name for the balance of the subgenus *Polymita* of von Martens. We have examined *varians*, Mke. (Amer. Journ. Conch., VII. 206, and L. and Fr. w. Shells, I. 185); *Troscheli*, Pfr. (Ann. N. Y. Lyc., x. 343); *graminicola*, Ad. (Am. Journ. Conch., VII. 178); *gallopavonis*, Val. 343. (N. Y. Am. X. 343.) All agree in having an arched ribless jaw with blunt

median projection. All have lingual dentition such as I figure of *graminicola* (plate X., fig. 8).

Liochila.—As stated already (p. 56) *H. picta*, Born, must be removed from this subgenus to *Polymita*, probably also *H. sulphurosa*, Mor.

Eurycratera has decided stout ribs on its jaw. We have seen *H. crispata*, Fér. (Am. Journ. Conch., VII. 179), and *H. angulata*, Fér. (this paper, p. 50). The lingual dentition is essentially the same in each, but on account of difference in the development of the points of the side cusp, I figure that of each (pl. IX. fig. 5; pl. X. fig. 9).

Polydotes has the same type of dentition, as in the last subgenus, as shown in my figure of *H. Luquillensis*, Shutt. (plate X., fig. 2-4) the only species examined by us. Jaw not seen.

Stylodon.—We have shown *H. militaris*, Pfr. to be a *Nanina* (Ann. N. Y. Lyc., x. 169). Other species unexamined by us.

Erepta.—The same may be said of *H. stylodon*, Pfr. (see ante, p. 48), and *leucostyla*, Pfr., and *rufizonata*, H. Ad. (Ann. N. Y. Lyc., x. 169), all Mauritius species.

Dentellaria.—We have examined a large proportion of the known species. The jaw varies somewhat, so that each description should be studied. There seems a tendency to a median projection to the cutting edge, and to the presence of ribs. *H. pachygastra*, Gray (Ann. N. Y. Lyc., x. 305) has 7 decided ribs and no median projection. *H. orbiculata*, Fér. (Am. Journ. Conch., VI. 205, pl. ix. f. 14) has traces of ribs and no median projection. *H. Isabella*, Fér. (l. c. VII. 179) has decided ribs and no median projection. *H. dentiens*, Fér. (Am. Journ. Conch., VII. 179) has decided ribs and no median projection. *H. nucleola*, Rang (ante, p. 52) has one decided rib and a median projection. *H. badia* (ante, p. 52) has 8 decided ribs. *H. formosa*, Fér. (ante, p. 52) has no ribs, but a strong median projection. *H. perplexa*, Fér. (Ann. N. Y. Lyc., x. 221) has obsolete ribs and median projection. *H. lychnuchus*, same as last (Ann. N. Y. Lyc., x. 221, pl. xiv. f. 5, 7). *H. punctata*, Born (ante, p. 52) has median projection and decided ribs. *H. Josephinæ*, Fér. (Ann. N. Y. Lyc., x. 306) is strongly arched, has no ribs, but a median projection.

All the above species agree in their dentition. See figure of that of *lychnuchus* (l. c.) and of *punctata* (plate IX., fig. 8 of this paper.)

Pleurodonta.—The jaw in *Chemnitziana*, Pfr. (ante, p. 51) has 7 stout, separated ribs; *Carmelita*, Fér. has 6 (ante, p. 51); *acuta*, Lam. (Amer. Journ. Conch., VI. 204) has 7 ribs.

The lingual membrane is the same as I figure for *Carmelita* (plate X., fig. 5) in *Schroteriana* (Amer. Journ. Conch., VII. 179), in *invalida*, Ad. (Ann. N. Y. Lyc., x. 179). In *acuta*, Lam. the centrals and laterals are of the same type, but the marginals have only one long, wide, blunt denticle, slightly bifid at end. In this respect it is more like *Caracolus* than the other species of *Pleurodonta* examined by us.

Caracolus.—We have shown *H. Bermudensis*, Pfr. (Ann. N. Y. Lyc., x. 221) to belong to *Vitrininae*; *H. inversicolor* (l. c. x. 169) to *Nanina*.

The jaw in *H. marginella*, Gmel. (ante, p. 51) appears to be ribbed.

I figure (plate X., fig. 6-7) the lingual dentition of *H. excellens*, Pfr. (Am. Journ. Conch. VII. 180). *H. marginella*, Gmel. agrees with it, excepting that the cusps of the marginals are shorter.

Leptoloma.—We have described only *H. fuscocincta*, Ad. (Am. Journ. Conch., VII. 180). The jaw has a median projection, but no ribs. The lingual I figure on plate IX., fig. 9.

Acavus.—*H. phoenix*, Pfr. has a ribless jaw (Am. Journ. Conch., VII. 180). Its dentition is figured on plate IX., fig. 11.

In *Bulimus* we have examined the following genera:—

Macrodontes we know by *B. odontostomos* (Am. Journ. Conch., VI. 209). The jaw is ribless. The dentition is figured on plate VI., fig. 7.

Pelecychilus we know from *B. aurissileni*, Born (Ann. Lyc. N. H. N. Y., x. 229), and *B. glaber*, Gmel. (not before published); both have delicate ribs as in *Bulimulus*, *Cylindrella*, etc. The dentition of the former is given on plate VI., fig. 4; of the latter on plate VI., fig. 6.

Anthinus we know from *B. multicolor*, Rang (Am. Journ. Conch., VI. 208). The jaw is ribless. Lingual dentition given on plate VI., fig. 8.

Pachyotus we know from *B. egregius*, Jay (see this paper, p. 54). Jaw not examined. Lingual dentition figured on plate VI., fig. 1.

Borus.—We have examined *B. oblongus*, Mull. Its ribbed jaw and lingual dentition are figured by Heynemann (Mal. Blatt., xv.).

Of *Orphnus* we have examined one species, *B. Hanleyi*, Pfr. (Am. Journ. Conch., VI. 208). The jaw is ribless, with a median projection. The lingual dentition is given on plate VI., fig. 5.

Dryptus we have examined in two species, *B. pardalis*, Fér. (Am. Journ. Conch., VII. 181) and *B. marmoratus*, Dunk. (l. c.). The jaw of the latter is unknown. In the former it is ribbed. The lingual dentition of *B. marmoratus* is given on plate VI., fig. 2. In *B. pardalis* it has not been examined.

Eurytus we know from only one species, *B. aulacostylus*, Pfr. (Ann. Lyc. N. H. N. Y., x. 282). The jaw has delicate ribs as in *Bulimulus*, *Cylindrella*, etc. The lingual dentition is given on plate VI., fig. 3.

A comparison of the figures I have given of the lingual dentition of the subgenera of *Bulimus* shows a greater constancy in that genus than in *Helix*, especially as regards the marginal teeth.

I add a figure of the dentition of *Cochlostyla fulgetrum*, Brod. (plate V., figs. 14-16). See Am. Journ. Conch., VII. 180.

EXPLANATION OF THE PLATES.

PLATE II.

- A. *ARIOLIMAX NIGER*, *J. G. Cooper*. The tail enlarged to show the caudal mucus pore. From the type in the California State Collection, preserved in spirit.
- B. *ARIOLIMAX COLUMBIANUS*? The tail, slightly enlarged, of a specimen from Mr. Hemphill (see p. 35) showing the mucus pore. It must be borne in mind that the specimen has long been preserved in spirit.
- C. *ARIOLIMAX COLUMBIANUS*? A specimen from San Mateo Co., California, received from Mr. Henry Hemphill (see p. 38). The genitalia about life size.
1. The testicle.
 2. The epididymis.
 3. The accessory gland of the last?
 4. The prostate gland.
 5. The sac of the penis.
 6. The retractor muscle of the penis.
 7. The vas deferens.
 8. The oviduct.

- 9. The genital bladder.
- 10. The external orifice of the genitalia.
- 11. The ovary.
- 16. The duct of the genital bladder.
- D. A portion of the digestive organs of the same.
 - 1. The buccal mass.
 - 2. The œsophagus.
 - 3, 3. The ducts of the salivary glands.
 - 4, 4. The salivary glands.
 - 5. The pouch of the lingual membrane.
- E. The same; an extreme marginal tooth of the lingual membrane.
- F. Same as last—life size.
 - 1-4. See fig. D.
 - 5. The stomach.
 - 6. The blind sac of the same.
 - 7, 7. The biliary ducts.
 - 8. The intestine.
 - 9. The rectum.
- G. The same. The rudimentary internal shell.
- H. The same. The jaw.

PLATE III.

- Fig. I. *ZONITES LÆVIGATUS*, Raf. The genital system. Same references as in pl. II. fig. c.
 - 13. Dart sac? See p. 39.
- Fig. II. *Helix reticulata*, Pfr. = *RAMENTOSA*, Gld. Genital system. Same references as in fig. 1.
 - 13. Vaginal prostate.
 - 13a, a. Flagella of same.
 - 15. Flagellum of penis.
 - 16a. Accessory to duct of genital bladder.
- Fig. III. *HELIX MITCHELLIANA*, Lea. Genital system. Same references as in fig. I.
- Fig. IV. *HELIX KELLETTI*, Forbes. Genital system. Same references as in fig. II.
 - 14. Dart sac? See page 40.
- Fig. V. *HEMPHILLIA GLANDULOSA*. Genital system. Same references as in fig. I.
- Fig. VI. The same. See page 39 for 5a and 5b.

PLATE IV.

Fig. I. Genitalia of *MACROCICLIS VANCOUVERENSIS*, Lea.

1. Testicle.
2. Epididymis.
3. Accessory gland.
4. Prostate.
5. Sac of penis.
7. Vas deferens.
8. Oviduct.
9. Genital bladder.
10. External orifice.
11. Ovary.
14. Dart sac? vaginal prostate?
16. Duct of genital bladder.

Fig. II. Genitalia of *PATULA STRIGOSA*, Gld. Same references as in fig. I.

Fig. III. Genitalia of *HELIX NICKLINIANA*, Lea. Same references as in fig. I.

6. Retractor muscle of penis.
13. Vaginal prostate.
- 13a. Flagellum to last.
15. Flagellum to penis.
- 16a. Accessory duct to the genital bladder.

Fig. IV. Genitalia of *HELIX APPRESSA*, Say. Same references as in fig. I.

Fig. V. Genitalia of *H. ROEMERI*, Pfr. Same references as in fig. I.

PLATE V.

Fig. 1. Lingual dentition of *HELIX TEXASIANA*, Mor. Central, lateral, and marginal teeth.

Fig. 2. Same of *BULIMULUS PERUVIANUS*, Brug.

Fig. 3. *LITHOTIS RUPICOLA*, Bl. Jaw.

Fig. 4. Same; central and lateral teeth.

Fig. 5. Same; marginal teeth.

Fig. 6. Same; extreme marginal teeth.

Fig. 7. *ERINNA NEWCOMBI*, A. Ad. Jaw.

Fig. 8. Same; central and lateral teeth.

Fig. 9. Same; marginal teeth.

Fig. 10. Same; extreme marginal teeth.

- Fig. 11. *BULIMULUS CHRYSALIS*, Pfr. Jaw.
 Fig. 12. Same; central and lateral teeth.
 Fig. 13. Same; marginal teeth.
 Fig. 14. *COCHLOSTYLA FULGETRUM*, Brod. (*Canistrum*); central and lateral teeth.
 Fig. 15. Same; first marginal teeth.
 Fig. 16. Same; extreme marginal teeth.
 Fig. 17. *HELIX WETHERBYI*, Bland; central and lateral teeth.
 Fig. 18. Same; marginal teeth.

PLATE VI.

Central, lateral, and marginal teeth of—

- Fig. 1. *BULIMUS EGREGIUS*, Jay (*Pachyotus*).
 Fig. 2. *MARMORATUS*, Dunk. (*Dryptus*).
 Fig. 3. *AULACOSTYLUS*, Pfr. (*Eurytus*).
 Fig. 4. *AURIS-SILENI*, Born (*Pelecychilus*).
 Fig. 5. *HANLEYANUS*, Pfr. (*Orphnus*).
 Fig. 6. *GLABER*, Gmel. (*Pelecychilus*).
 Fig. 7. *ODONTOSTOMUS*, Sowb. (*Macrodontes*).
 Fig. 8. *MULTICOLOR*, Rang. (*Anthinus*).

PLATE VII.

- Fig. A. *AMPHIBULIMA PATULA*, Brug. Dominica.
 Fig. B. Same, to show variations in cusps of laterals.
 Fig. C. *AMPHIBULIMA PATULA*. St. Kitts, see p. 44.

PLATE VIII.

- Fig. 1. *STROPHIA DECUMANA*, *a.* Central and lateral teeth; *b.* marginal teeth.
 Fig. 2. *AMPHIBULIMA RUBESCENS*, Desh. Jaw.
 Fig. 3. Same. Lingual membrane. *a.* Central and lateral teeth
b. marginal teeth; *c.* extreme marginal teeth.
 Fig. 4. Same. Genitalia.
 Fig. 5. *AMPHIBULIMA APPENDICULATA*, Pfr. Genitalia.
 Fig. 6. Same. Lingual membrane. *a.* Central and lateral teeth;
b. marginal teeth.
 Fig. 7. *GONOSPIRA NEWTONI*, H. Ad. Genitalia.

PLATE IX.

Lingual dentition; central, lateral, and marginal teeth of—

- Fig. 1. *HELIX PEMPHIGODES*, Pfr., *Cysticopsis*.

- Fig. 2. *HELIX GOSSEI*, Pfr., *Coryda*.
 Fig. 3. *HELIX BOISSIERI*, Charp., *Leucochroa*.
 Fig. 4. *HELIX HALDEMANIANA*, Ad., *Sagda*.
 Fig. 5. *HELIX ANGULATA*, Fér., *Eurycratera*.
 Fig. 6. *HELIX SIMILARIS*, Fér., *Dorcasia*.
 Fig. 7. *HELIX TURBINIFORMIS*, Pfr., *Microphysa*.
 Fig. 8. *HELIX PUNCTATA*, Born, *Dentellaria*.
 Fig. 9. *HELIX FUSCOCINCTA*, Ad., *Leptoloma*.
 Fig. 10. *HELIX NOTABILIS*, Fér., *Thelidomus*.
 Fig. 11. *HELIX PHŒNIX*, Pfr., *Acavus*.

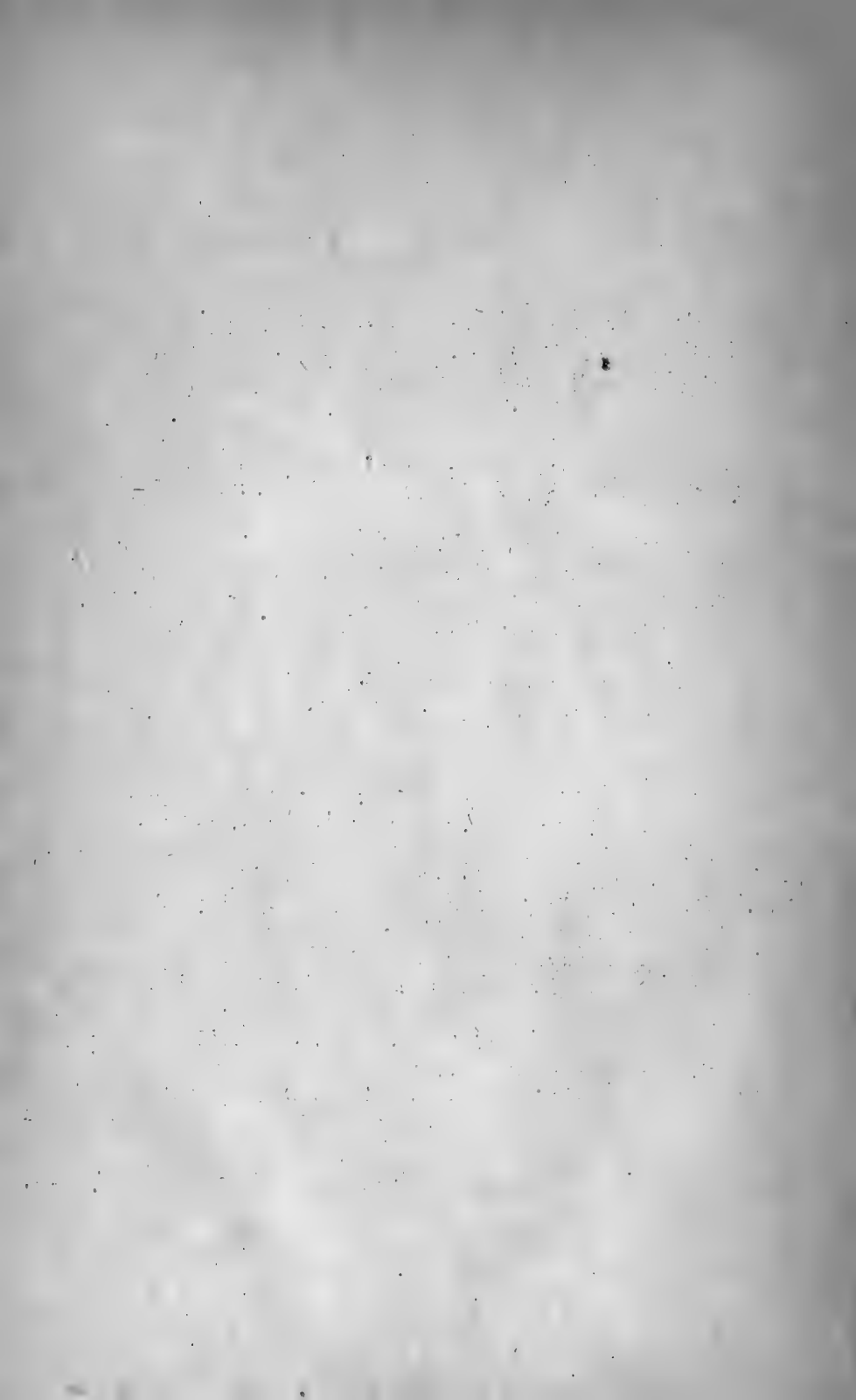
PLATE X.

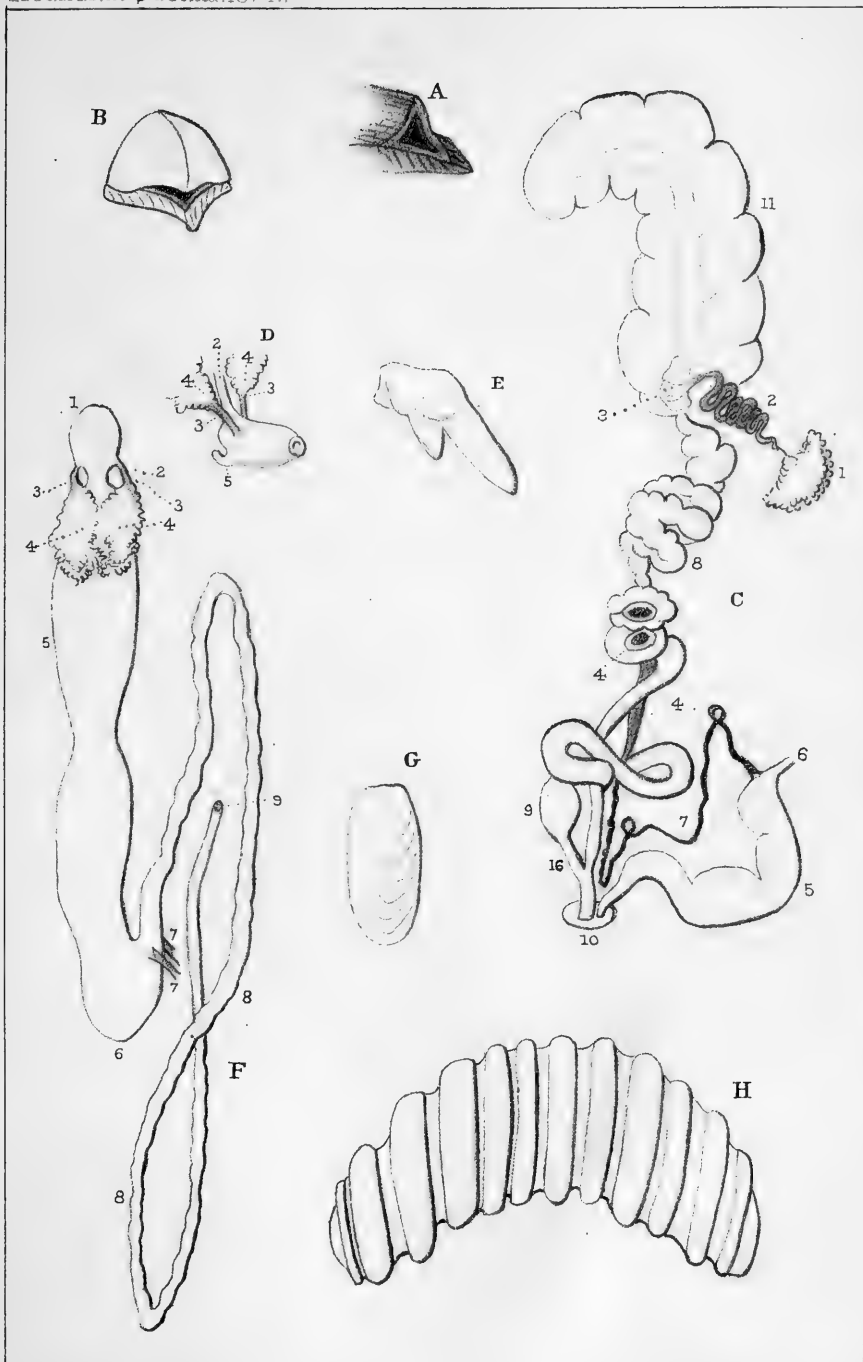
Central, lateral, and marginal teeth of lingual membrane of—

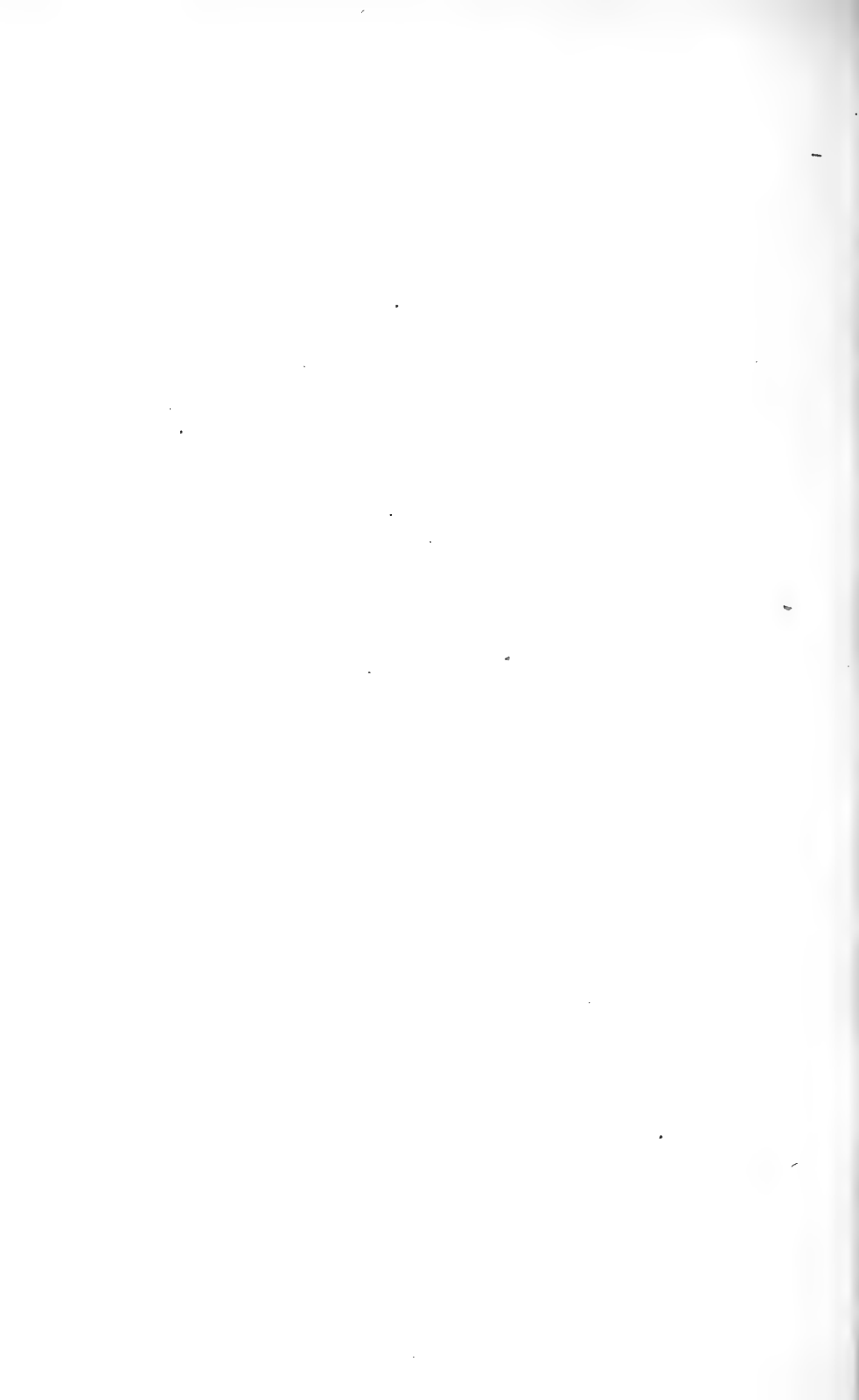
- Fig. 1. *HELIX DISCOLOR*, Fér., *Thelidomus*.
 Fig. 2, 3, 4. *HELIX LUGUILLENSIS*, Shuttl., *Polydontes*.
 Fig. 5. *HELIX CARMELITA*, Fér., *Pleurodonta*.
 Fig. 6, 7. *HELIX EXCELLENS*, Pfr., *Caracolus*.
 Fig. 8. *HELIX GRAMINICOLA*, Ad., *Polymita*.
 Fig. 9. *HELIX CRISPATA*, Fér., *Eurycratera*.
 Fig. 10. *HELIX MACROGLOSSA*, Pfr., *Plagioptycha*.
 Fig. 11. *HELIX GRISEOLA*, Pfr., *Fruticicola*.

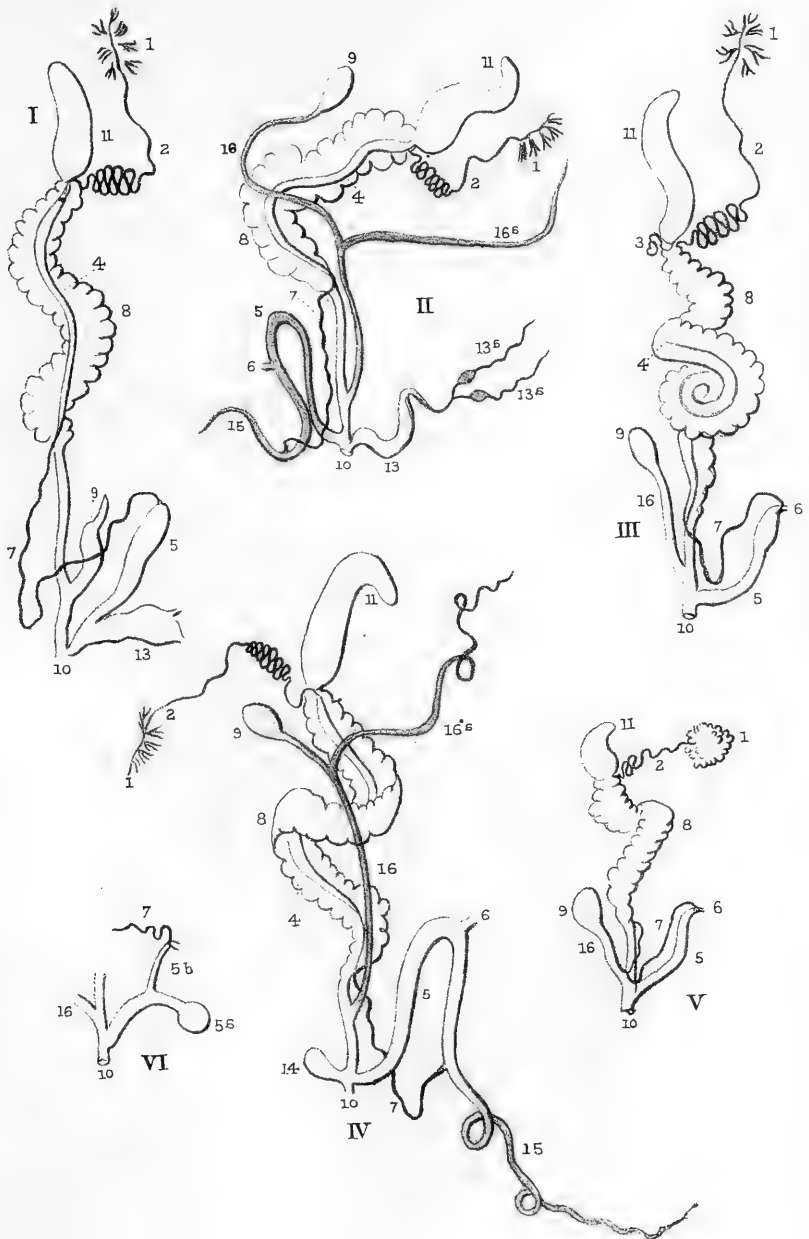
PLATE XI.

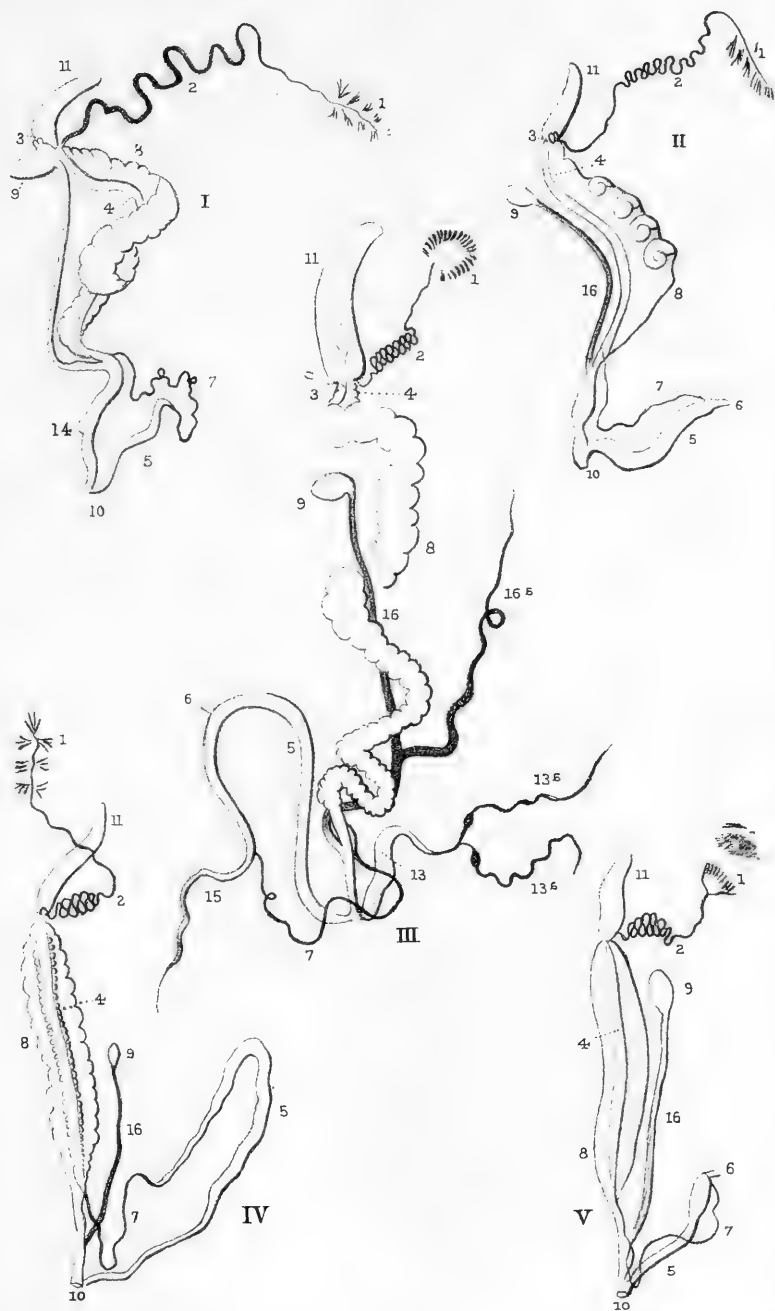
- A. *ARIOLIMAX NIGER*, J. G. Coop. From the type in the California State collection. Extreme marginal teeth from the lingual membrane.
 B. Same as last. The central tooth and first lateral teeth.
 C. Same as last. The genitalia enlarged. References same as in fig. C. of plate II.
 13. The vaginal prostate.
 D. *ARIOLIMAX CALIFORNICUS*? From a specimen from San Mateo, Cal., in the Museum of Comparative Zoology. The genitalia slightly enlarged. Same references as in last figure, excepting 15, the flagellum.
 E. Same as last. The digestive organs, life size. Same references as in fig. F. of plate II.
 F. The same. 1. Central tooth; 2. first lateral tooth of the lingual membrane.
 G. The same. Extreme marginal tooth of the lingual membrane.



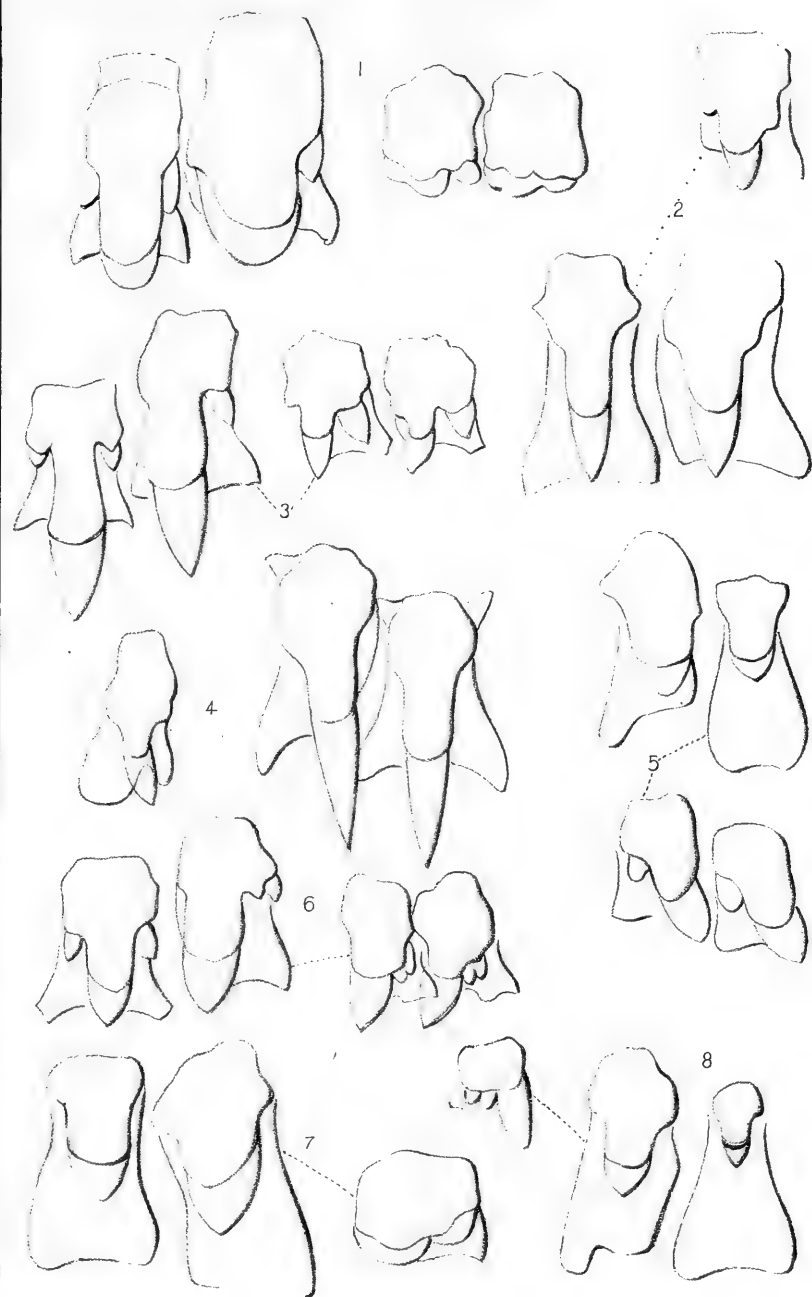


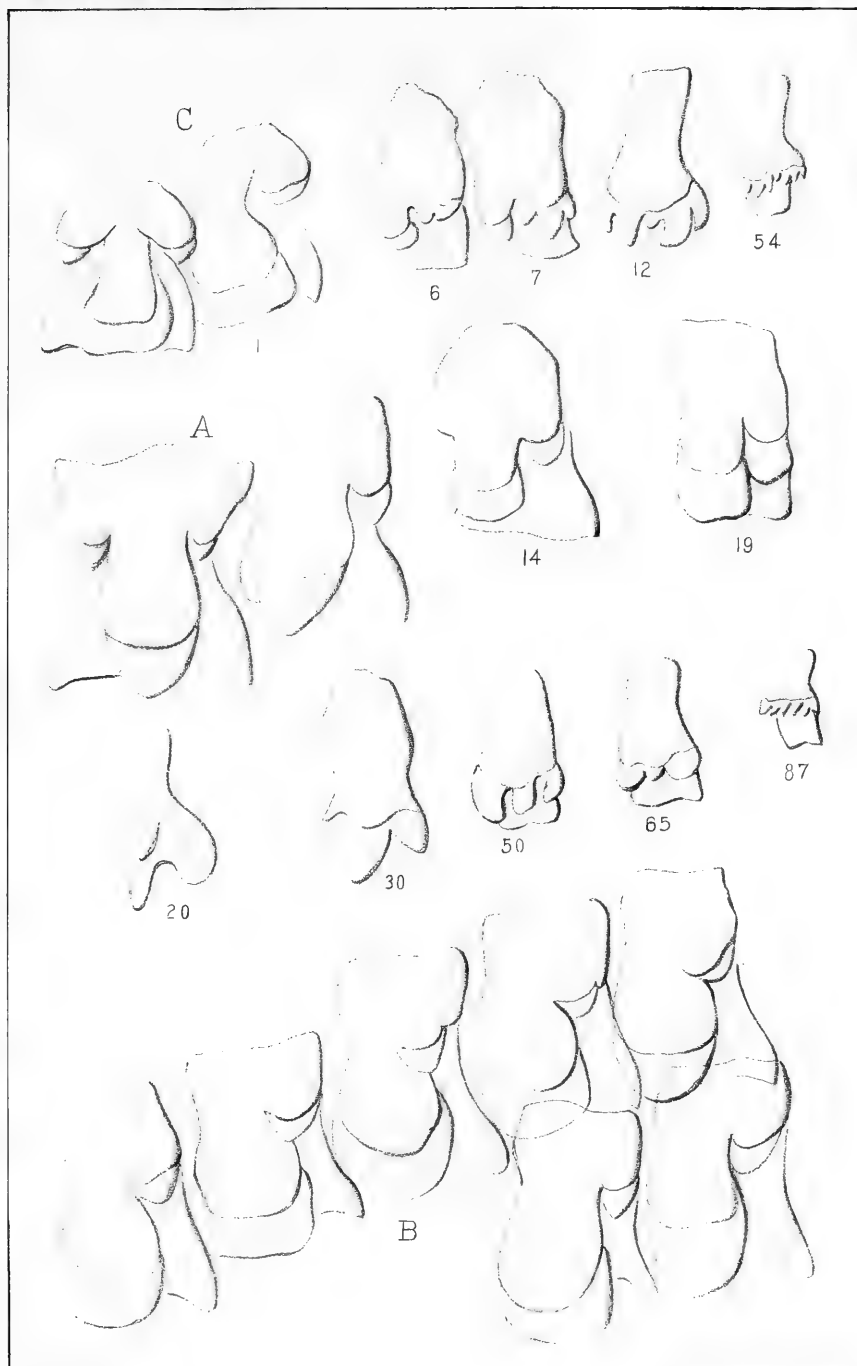


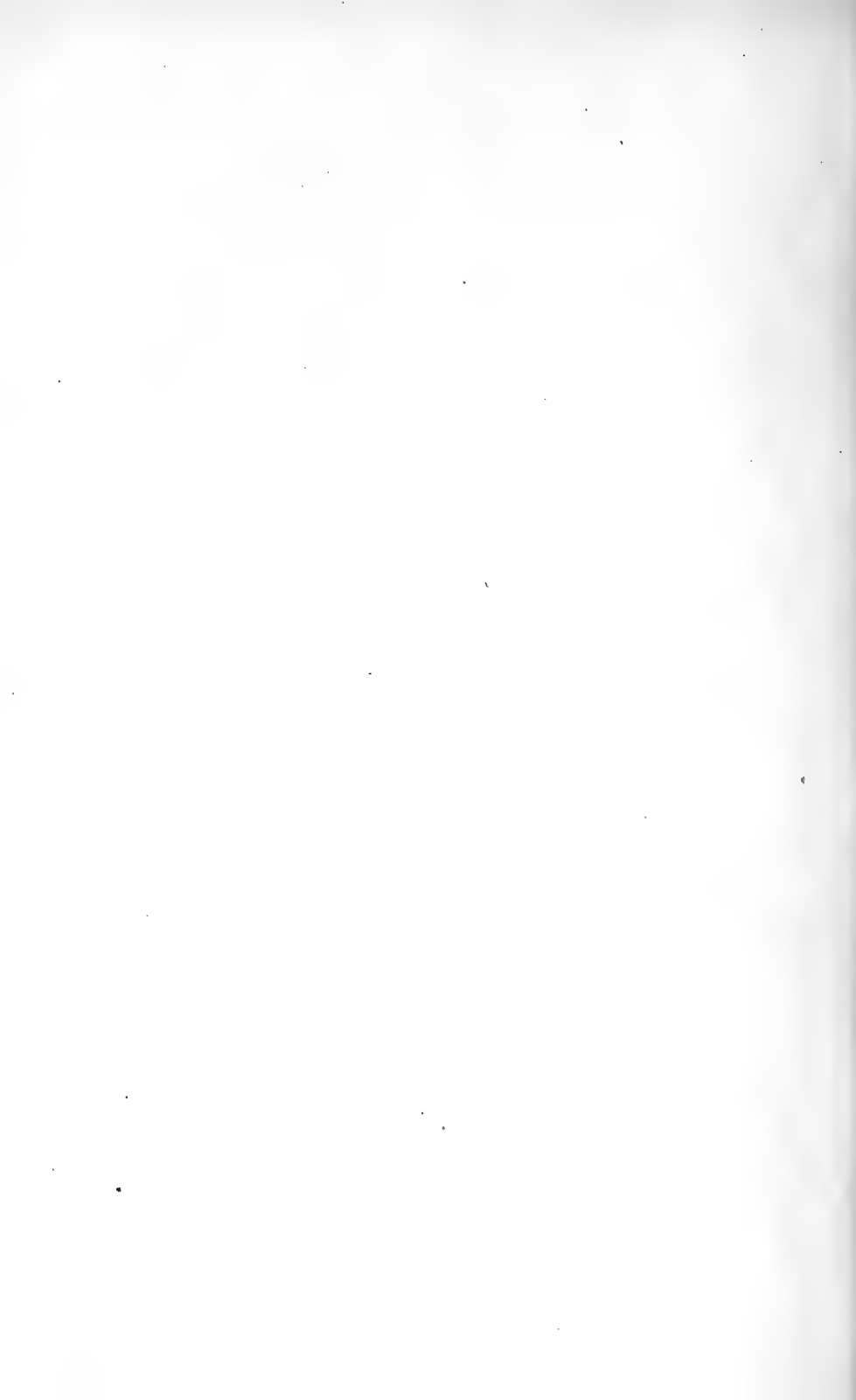


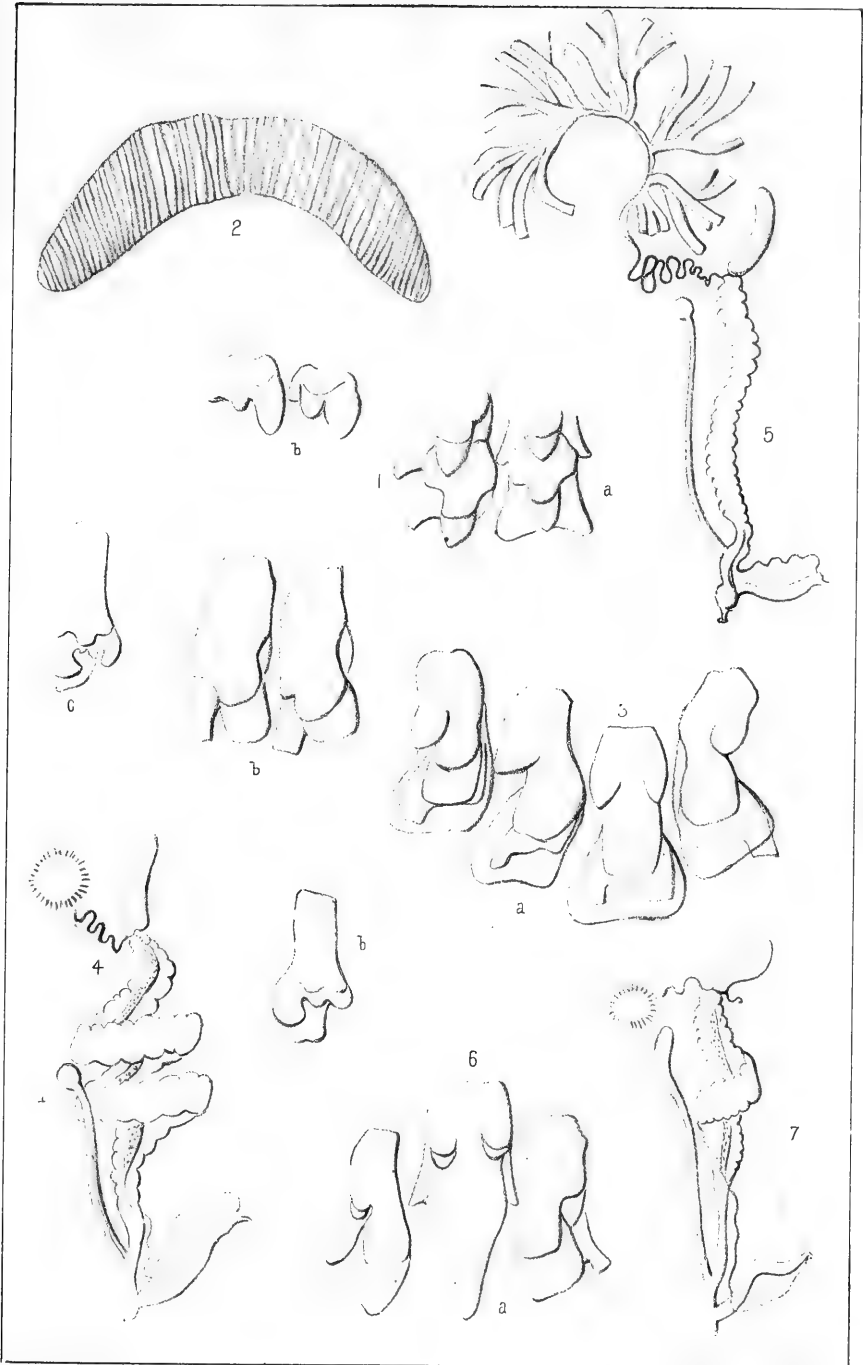






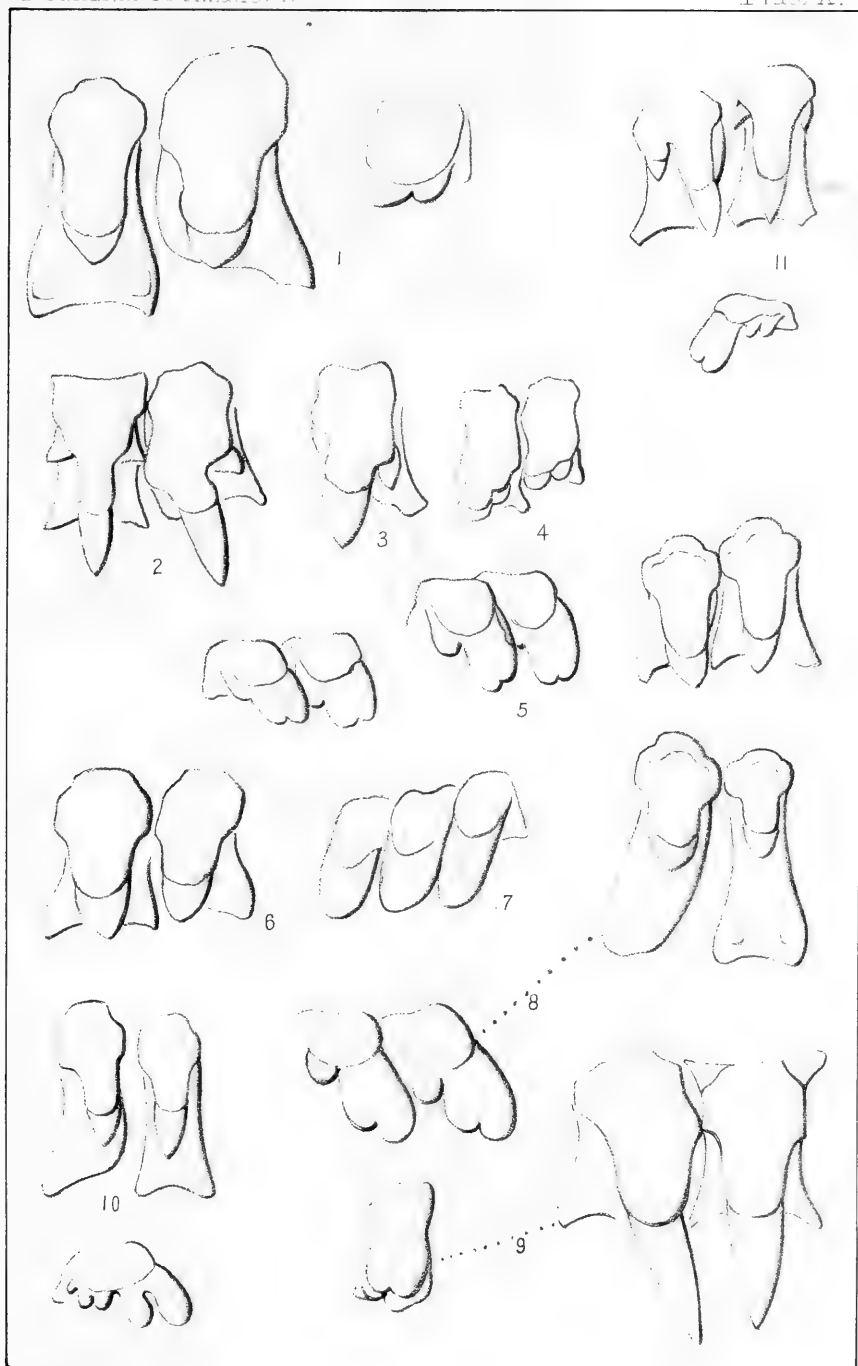


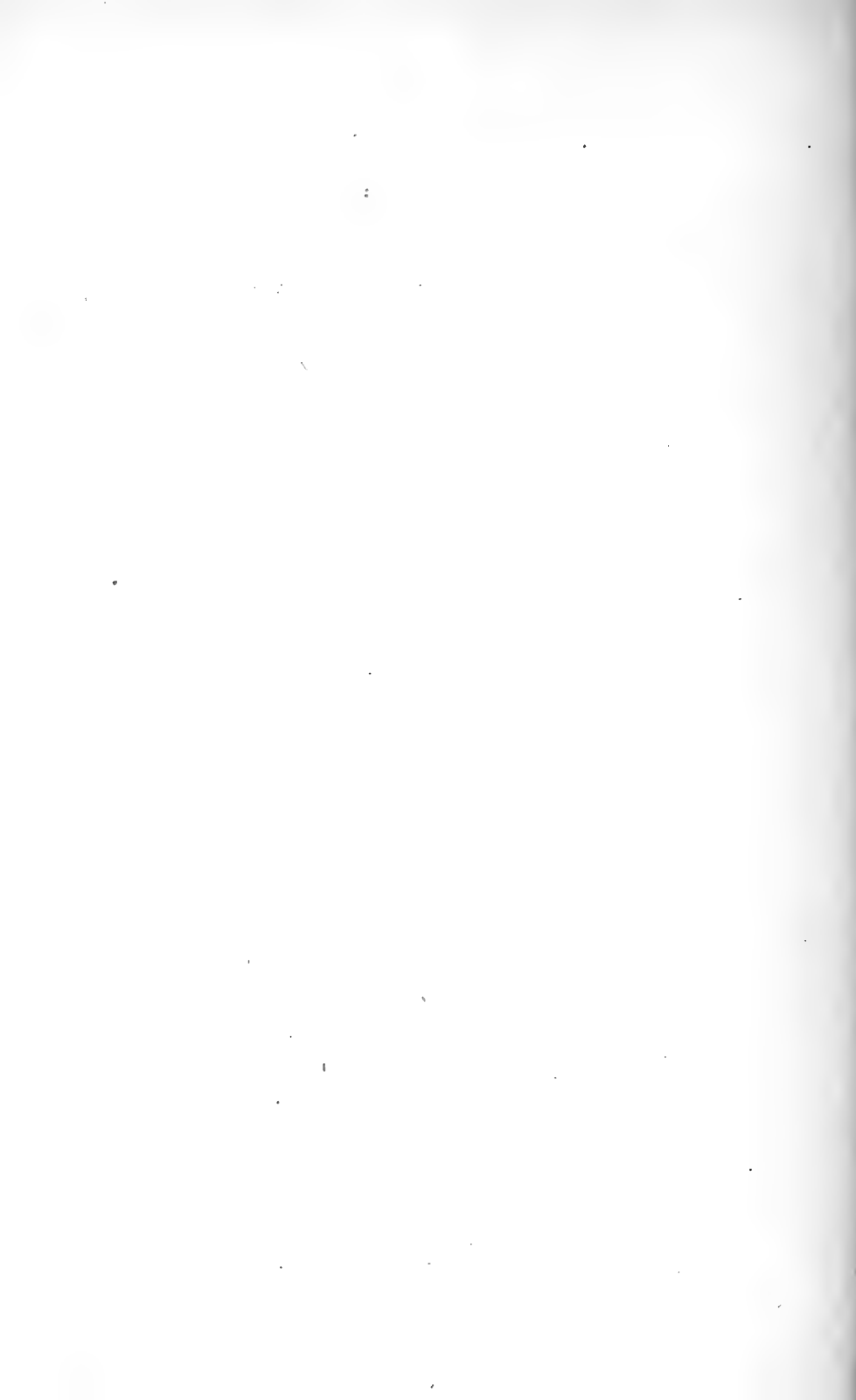


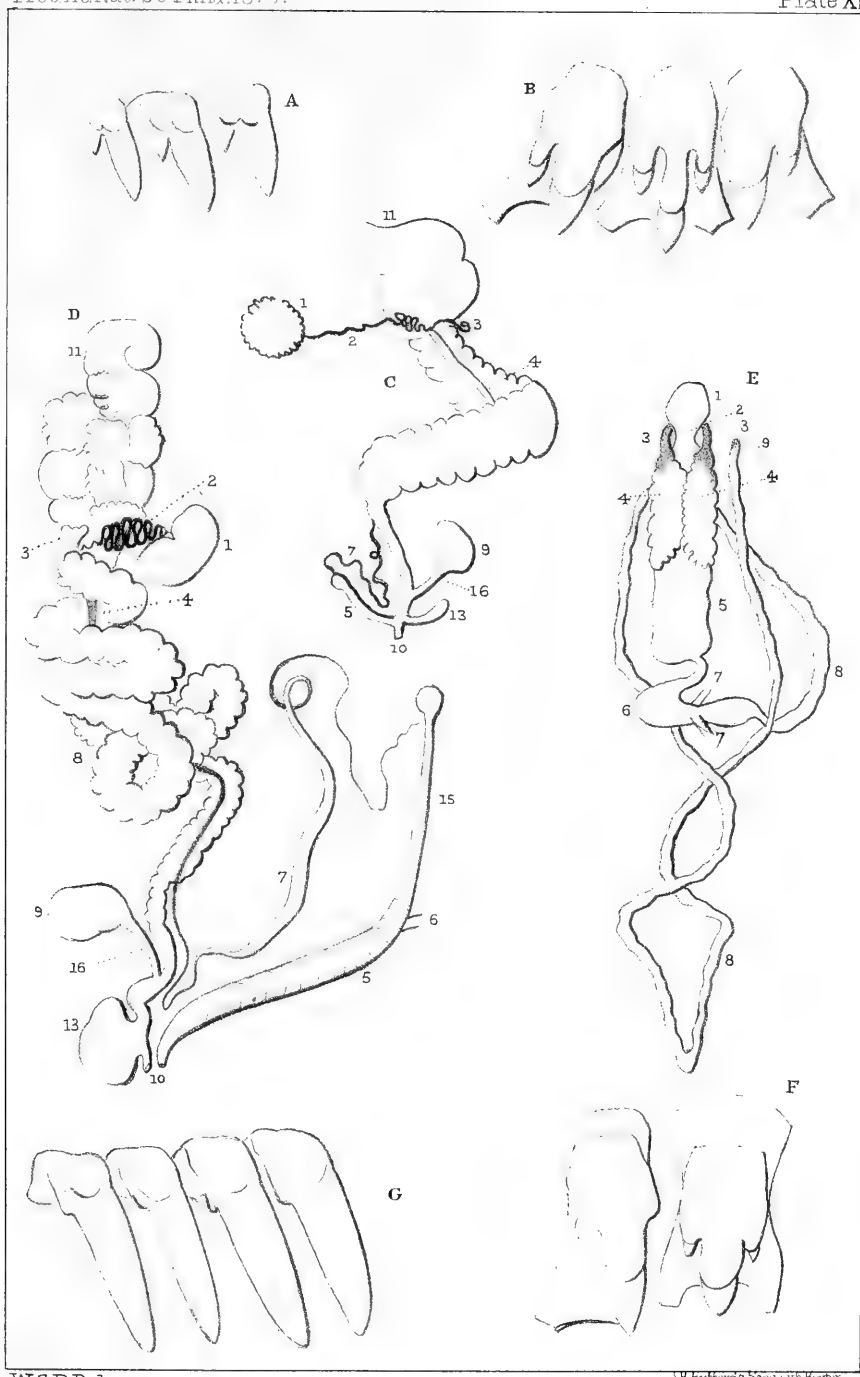


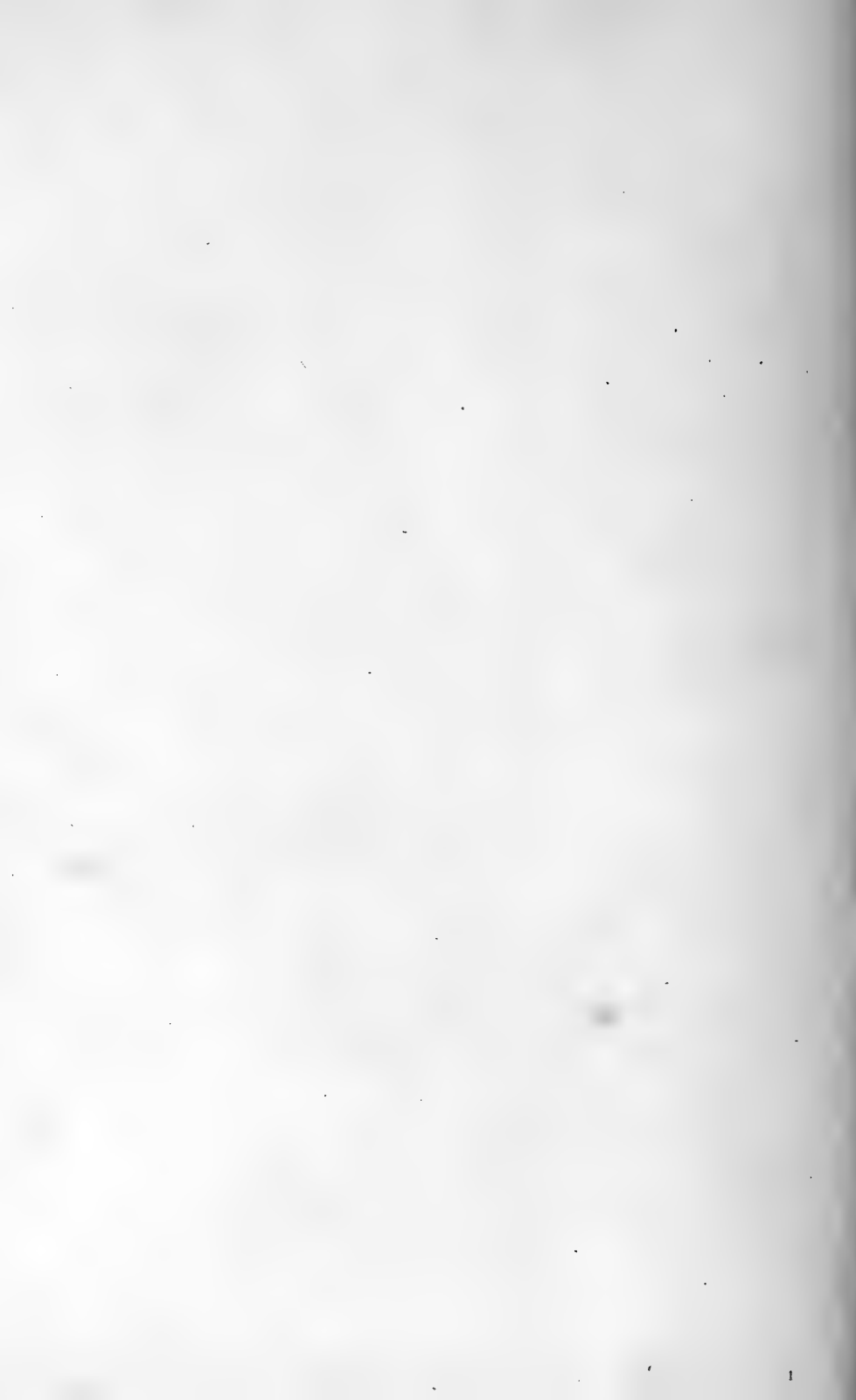












NOTES
ON
AMERICAN LAND SHELLS

AND OTHER
MISCELLANEOUS CONCHOLOGICAL CONTRIBUTIONS.

VOL. II. PART II.

BY
W. G. BINNEY.



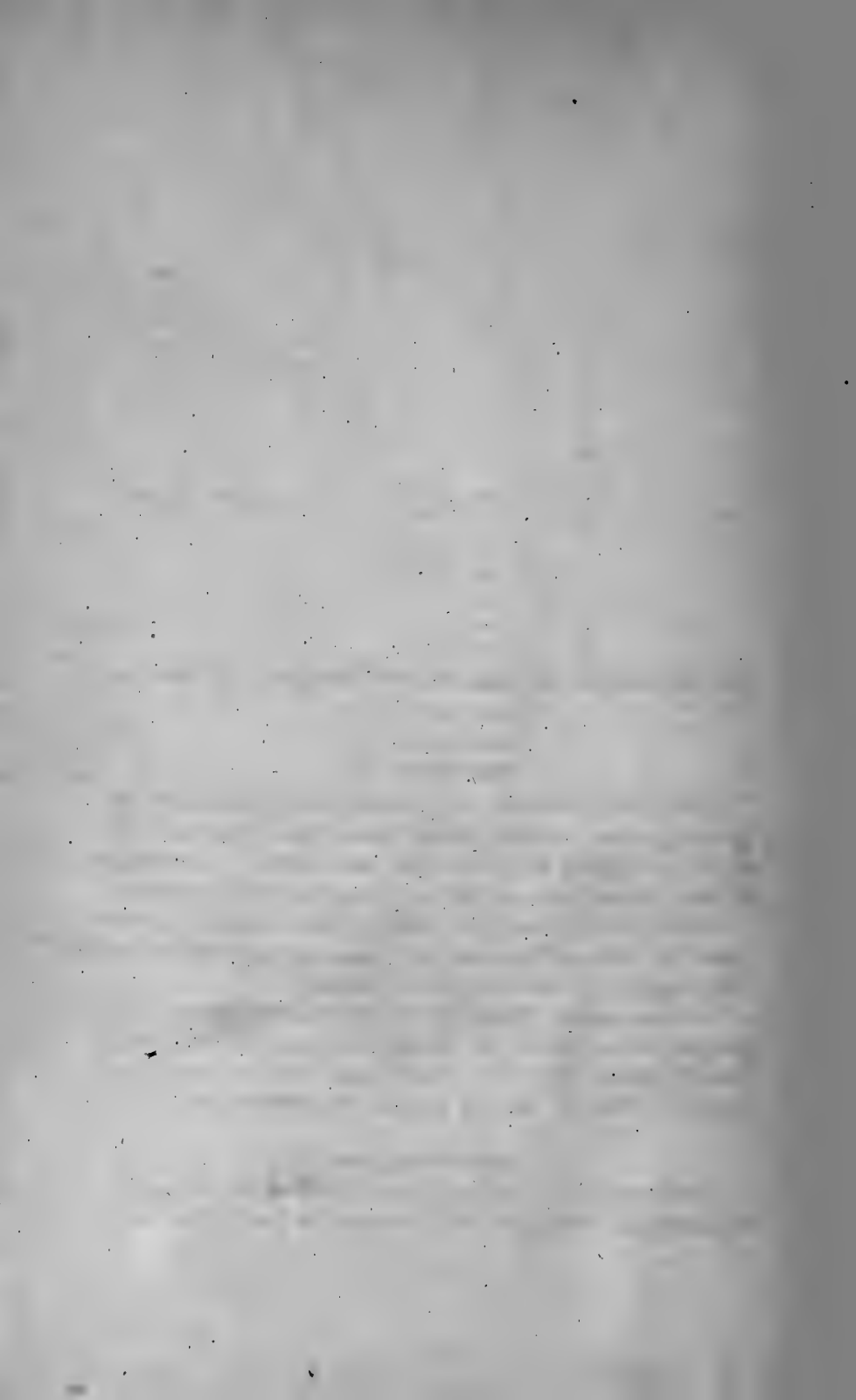
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ON THE
GENITALIA AND LINGUAL DENTITION
OF PULMONATA.

BY
W. G. BINNEY.

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IV.—*On the Genitalia and Lingual Dentition of Pulmonata.*

BY W. G. BINNEY.

With Plates I-VI.

Read May 25th, 1874.

It will be noticed that in the following descriptions of the genital system, I have followed Dr. Leidy (Terr. Moll. U. S., I) in applying the terms *ovary* and *oviduct*. I am aware of other names being applied to the organs by other authors.

I take this opportunity of strongly urging upon conchologists the study of the genital system as a most reliable specific character, in the terrestrial Pulmonata.

For the species extralimital to the United States, I am indebted to my friend, Mr. Thomas Bland, as well as for their identification. The most interesting of them were collected by Prof. Orton, in his late journey in northern Peru.

***Limax flavus*, Linn.**

A few days since a colony of this species was discovered by a friend in the cellar of his house in Burlington, N. J.

The specimens agree perfectly with the description and figures in, the "Terrestrial Mollusks of the United States." The genital system is also the same as figured by Leidy in the same work, and by Moquin-Tandon (Moll. Terr. et Fluv. de France). There can be no doubt, therefore, of the identity of the species.

The figure of the dentition of this species given by me in L. and F. W. Shells N. A., I, p. 63, f. 105, is drawn from some other species.

The true *L. flavus* now examined by me has central teeth with subobsolete side cusps, bearing no cutting points, central cusp short, with a short, bluntly pointed cutting point. Laterals like the centrals, but unsymmetrical. Marginals aculeate, the extreme ones bifurcated. Teeth in the lingual examined over 60-1-60.

The figure by Dr. Leidy published by Mr. Bland and myself (Ann. Lyc. Nat. Hist. of N. Y., IX, 285) though unsatisfactory, was, no doubt, drawn from this species.

The lingual membrane examined by me agrees with the figures given by Heynemann* of the dentition of *L. flavus*.

***Limax agrestis*, Linn.**

Specimens from Burlington, N. J., of this species, of undoubted identity, agreeing externally and anatomically with the figures in the "Terrestrial Mollusks of the United States," furnished the lingual membrane here described.

Teeth 50-1-50, with 14 perfect laterals. Centrals long, narrow, with a middle long cusp, extending to the lower edge of base of attachment, and bearing a long, acute cutting point, extending far below the lower edge; side cusps subobsolete, but bearing well-developed, triangular cutting points. Laterals like centrals, but unsymmetrical by the changed form of the inner cutting point. Marginal teeth aculeate, the extreme ones do not appear to be bifurcate.

Jaw wide, low, slightly arcuate, with broad median projection.

* See Mal. Blatt, X.

***Limax* Hewstoni, I. G. Cooper.**

The specimens examined are from the state collection of California, presented by Dr. J. G. Cooper.

These specimens are not in good condition for anatomical examination, but I am able to state that both testicle and ovary are large. The oviduct is long and greatly convoluted. The prostate is well developed. The vagina is very short, the very short duct of the genital bladder enters at about its middle. The last named organ is large, globular. The penis is small, short, cylindrical, expanded and bulbous at its apex, where the vas deferens enters. I could detect no accessory organs in the single specimen imperfectly examined.

The genitalia are somewhat of the same type as those of *L. flavus* (see Terr. Moll. U. S., I), Linn., but the dentition of the latter is quite distinct (see above). There is a still stronger resemblance to the genitalia of *Amalia gagates* as figured by Semper (Phil. Archip., pl. xi, fig. 9), so far as the penis and genital bladder are concerned.

The species certainly belongs to the section *Amalia*, as understood by Semper (l. c. p. 84) and Heynemann (Mal. Blatt., X, 200) as shown by the dentition of the lingual membrane. I have already, in connection with Mr. Bland (Ann. N. Y. Lyc. N. H., X, 349), described the dentition. It is necessary, however, to be more explicit in the description, as several types are found in the genus *Limax* (in the broad sense usually adopted).

Dr. Cooper's type now before me has the lingual membrane long and narrow. There are about 50-1-50 teeth. The centrals are tricuspid, the middle cusp is stout and reaches to the lower edge of the base of attachment, the side cusps are not well developed; all three cusps bear a cutting point. The base of attachment is almost as broad as high. The lateral teeth, about 22 or 25 in number, are of the same type as the centrals, equally tricuspid, and so symmetrical as to be with great difficulty distinguished from the central tooth, excepting the outer ones, which lose the inner cusp. The marginal teeth are aculeate, not bifid, and are generally short and stout, but in some specimens are long and slender.

So far as outward appearance goes, the species somewhat resembles *Amalia marginata*, Drap., as figured by Lehmann (Lebenden Schnecken, etc., pl. v, fig. B). It is, however, by no means certain that it was introduced into San Francisco, as Mr. H. Hemphill has sent me specimens of an

Amalia from Los Angeles. His species had about 48 teeth in each row, 16 being laterals, the balance marginals, a difference of arrangement which may fairly be considered to show a specific difference between his specimens and the San Francisco form, though his discovery leads us to consider *Amalia* as native to California.

***Limax maximus*, Linn.**

I have also reëxamined the lingual of this species from specimens collected in Newport, R. I. (see my edition of Gould's Invertebrata of Mass., p. 407, fig. 669) and find it to agree with the descriptions and figures of Lehmann and Heynemann. I am preparing an exhaustive paper on the dentition of our land shells, in which more particular descriptions of the dentition of all our species will be given. I will here say, however, that in the specimen examined by me the bifurcation of the marginals commences nearer the median line than is described by Heynemann. There are but twelve marginals without bifurcation in my specimen, that is, the bifurcation commences at about the thirtieth tooth from the central line. Heynemann gives the commencement of the bifurcation at the sixty-fifth tooth. There are 76-1-76 teeth.

***Limax campestris*, Binney.**

To complete the series of North American *Limaces*, I subjoin a summary of the characters of this species, the only one now known to be native to eastern North America. There are 36-1-36 teeth, 11 being perfect laterals, and 25 being marginals. Of the latter about one-half are bifid. The centrals and laterals are of the same type as in *L. agrestis*.

Judging from dentition alone, *L. maximus* and *flavus* would be placed in *Heynemannia*, a subgenus of *Limax*; *agrestis* in s. g. *Agriolimax*; *campestris* in s. g. *Malacolimax*; while *Hewstoni* would be in the genus *Amalia*. (See Heynemann, Nachr. Mal. Gesell., II, 163.)

Limax Weinlandi, Heynemann (Mall. Blatt., X, 212), I do not know. The figure given by Heynemann (l. c. pl. ii, fig. 1) of its dentition does not agree with that of *L. campestris*.

Limax campestris differs widely in its genitalia from *Limax agrestis*, as will be seen by Leidy's figures in Terr. Moll. U. S., I, pl. ii, figs. 6, 8.

***Zonites capnodes*,* W. G. Binney.**

Tennessee.

Jaw as usual in the genus.

Lingual membrane broad, with numerous rows of about 66-1-66 teeth. Centrals long, with a long, slender, median cusp, reaching the base of attachment and bearing a long, slender point projecting beyond it. Side cusps subobsolete, but represented by the cutting points, which are greatly developed, triangular, stretching beyond the sides of the base of attachment. Lateral teeth of same type as centrals, but bicuspid; there are about nine perfect laterals. Marginals aculeate, as usual in the genus.

I have not been able to observe the complete genital system of the species. The penis has the same arrangement as in *Z. lævigatus*. The external orifice is quite under the edge of the mantle.

In the Land Mollusken of the "Archip. der Philippinen" (p. 78, pl. iii, fig. 27; pl. v, fig. 21), Semper describes and figures the genital system, jaw and lingual dentition, which he refers to *Z. lucubratus*, Say. The specimen examined by him was from Tennessee. It is difficult to decide from what species Semper drew his description. It certainly was not the true *lucubratus*, which is a Mexican species. A comparison of my descriptions and figures of *lævigatus*, *inornatus*, *fuliginosus* and *friabilis* shows that neither of those species could have been before Semper. His description of the lingual membrane would better apply to *capnodes*. I have not been able to examine the whole of the genital system to see how nearly that also agrees with his figures.

* Formerly erroneously spelt *Kopnodes*.

Zonites friabilis, W. G. Binney.

Mr. A. G. Wetherby.

Jaw as usual in the genus.

Lingual membrane similar to that above described of *Z. capnodes*.
Teeth about 57-1-57, with six perfect laterals.

The genital system is figured on pl. V, fig. II. The ovary (11) is stout, light-brown, and blunt. The oviduct (8) is short. The vagina is long and narrow, with a yellow prepuce-like expansion at the entrance of the duct of the genital bladder, which is near the base. The genital bladder (9) is large, oval, on a duct of about equal length and size as the vagina. The penis sac (5) is long and slender, and peculiarly characterized by a lateral bulbous expansion near its base, bearing the retractor muscle (6). Beyond this bulb the sac is narrow, but gradually expands, and towards its end again very gradually tapers towards the apex, where the vas deferens (7) enters. Its orifice is side by side with that of the vagina.

I found no dart in the bulb-like organ attached to the penis. It probably is a form of prostate. The external orifice is under the mantle.

Zonites inornatus, Say.

The genitalia (pl. V, fig. I) have the same general arrangement as in *Z. friabilis*, herewith described. The ovary (11), however, is very much more developed, being in this species the most conspicuous organ in the system; the epididymis (2) is less convoluted, the oviduct (8) is longer, the vagina shorter, the genital bladder (9) more clavate, with a shorter duct (16), and there is a small globular vaginal prostate (13).

Zonites sculptilis, Bland.

Tennessee. Miss Annie E. Law.

Jaw as usual in the genus.

Lingual membrane long and narrow. Teeth about 40-1-40, with four perfect laterals. Centrals tricuspid, laterals bicuspid, the side cusps of each being almost obsolete, but surmounted by a triangular sharp point. Marginals aculeate. The dentition is of the same type as in *Z. capnodes*, see above. (Pl. II, fig. IV.) Fig. b represents the two extreme marginal teeth.

Zonites Elliotti, Redfield.

Hayesville, N. C. Miss Annie E. Law.

Lingual membrane as usual in the genus. It will be noticed that there are not any well developed side cusps to the centrals and laterals, though there are well developed cutting points. Teeth about 32-1-32, with six perfect laterals.

The character of the dentition, as well as the caudal mucus pore, proves the species to be a true *Zonites*, and not a *Macrocyclus*, in which genus it is placed by Tryon, Am. Journ. Conch., II, 246.

The existence of the dart sac and dart has already been published.

Zonites internus, Say.

An examination of the animal by Mr. Bland shows the existence of a dart.

Helix rufo-apicata, Poey. (*Hemitrochus*.)*

Cuba. Mr. Arango.

Jaw slightly arcuate, ends but little attenuated, blunt; anterior surface without ribs; cutting edge with a broad, blunt, median projection.

Lingual membrane (pl. V, fig. v) long and narrow. Centrals long and narrow with one median stout cusp, bearing a short, bluntly pointed cutting point, the side cusps subobsolete. Laterals like the centrals, but unsymmetrical. Marginals subquadrate, with one very broad, oblique, acutely trifid cutting point, the central division the largest.

The figure *a* gives one central tooth with two adjacent laterals, *b* gives two extreme marginals.

The dentition has the same general character as the other species of *Hemitrochus*, examined by me, viz., *gallopavonis*, *graminicola*, *varians* and *Troscheli*.

Helix badia, Fér. (*Dentellaria*.)

Martinique.

For jaw and dentition see Proc. Ac. Nat. Sc., Phila., 1874, p. 52.

Genital system resembling that of *H. Josephinae*, herewith described.

Helix nuxdenticulata, Chemn. (*Dentellaria*.)

Martinique.

For description of jaw and lingual dentition see Proc. Ac. Nat. Sc. Phila., 1874, p. 52.

The genital system is figured on pl. V, fig. VIII. The ovary (11) is short, stout. The oviduct (8) is wide, sac-like. The vagina is short, small, with a bulbous expansion near its top; the duct of the genital bladder enters, at about the middle of its length, the sac of the penis near its base. The penis sac (5) is very prominent. It is as long as the

*Mr. Bland and I have elsewhere (Ann. of Lyc. of Nat. Hist. of N. Y., X, 341) pointed out the great difference in the lingual dentition of *Helix muscarum*, Lea, the type of the subgenus *Polymita*, and the other species referred to the subgenus by von Martens. We have suggested using for the latter the name *Hemitrochus*. We have also shown that *H. picta* belongs to the true *Polymita*, sharing the peculiar dentition of *muscarum*.

oviduct, narrowed at its base, along the remainder of its course quite stout, but with a subcentral contraction, and a blunt apex, where the retractor muscle (6) is attached, and where the vas deferens (7) enters, the latter swollen at this point. The genital bladder (9) is small, oval; its duct (16) is long, irregular, narrowed above and below, but very much swollen along the middle three-fifths of its length. As with the penis, the duct of the genital bladder forms a conspicuous feature of the system.

***Helix nucleola*, Rang. (*Dentellaria*.)**

Martinique.

Lingual membrane and jaw already described by me (Proc. Ac. Nat. Sc., Phila., 1874, p. 52).

Genital system figured on pl. II, fig. vi. The ovary (11) is long and narrow. The oviduct (8) is long, rather stout, but little convoluted. The vagina is narrow, about one-third the length of the oviduct; just below the middle of its length it has a bulbous expansion, which receives the long, slender duct (16) of the small, oval genital bladder (9). The penis sac (5) enters the vagina near its base; it is very long, cylindrical, slender, with the vas deferens (7) and retractor muscle entering at its apex.

***Helix Josephinæ*, Fér. (*Dentellaria*.)**

Guadeloupe.

For description of jaw and lingual membrane, see Ann. Lyc. N. H. of N. Y., X, 306.

Genital system figured on pl. V, fig. ix. The testicle (1) is composed of white cæca tipped with brown. The epididymis is greatly convoluted near the ovary. The latter organ (11) is broad. The oviduct (8) is long. The vagina is long and narrow; it receives the long slender duct (16) of the small globose genital bladder (9) near its top. The penis sac (5) is long and slender, its opening being by the side of that of the vagina, rather than actually into the latter organ, its apex rapidly narrowing to an acute point, near which enters the vas deferens (7).

***Helix discolor*, Fér. (*Thelidomus*.)**

Martinique.

Jaw and lingual membrane already described by me (Proc. Ac. Nat. Sc. Phila., 1874, p. 51).

Genital system short and stout in its various parts, excepting the ovary (11) which is long, slender, acutely pointed. The epididymis (2) is long, convoluted at the end near the oviduct. The oviduct (8) is stout, sac-like. The genital bladder (9) is as long as the oviduct, clavate, stout, with no distinct duct, but gradually tapering to its entrance into the vagina, which is at the upper end of the latter. The penis sac (5) is the most

prominent organ. It enters the vagina at its base. It is as long as the whole system, stout, especially in its lower half, abruptly terminating in an acute point above, where it receives the vas deferens. The latter organ (7) is enlarged for some distance after leaving the penis sac. The retractor muscle (6) of the penis is inserted on the side of the sac, at the lower third of its length. Pl. II, fig. IX.

***Helix Troostiana*, Lea. (*Polygyra*.)**

Kentucky, Mr. A. G. Wetherby.

Jaw as usual in the sub-genus *Polygyra*, with about ten, broad, crowded ribs, denticulating either margin.

Lingual membrane (pl. V, fig. VI) long and narrow. Teeth about 25-1-25. Centrals and laterals quadrate, the former tricuspid, the latter bicuspid, the cusps stout: all the cusps with cutting points. Marginals low, wide, with one inner, oblique, stout, short, bluntly bifid cusp, and one outer, shorter, bluntly bifid cusp.

Genital system (pl. V, fig. III) long and slender, especially the ovary (11), and oviduct (8); vagina long, receiving the duct of the genital bladder below its middle, and the sac of the penis still lower down; penis long, tubular, of about same width as the vagina, with a prominent bulb at its apex, into the end of which is inserted the vas deferens (7) and at the side of which the retractor muscle (6) is attached; genital bladder (9) moderate, oval, on a duct (16) of about equal length and size as the vagina.

***Helix obstricta*, Say. (*Triodopsis*.)**

Ohio, Mr. A. G. Wetherby.

The genital system resembles exactly that of *H. palliata*, Say, as figured by Dr. Leidy in Terr. Moll. U. S., I, pl. vii, fig. 8.

***Helix Clarki*, Lea. (*Triodopsis?* *Mesodon?*)**

Hayesville, N. C., Miss Annie E. Law.

Jaw as usual, arcuate, ends attenuated, blunt; anterior surface with about fourteen stout, separated ribs, denticulating either margin.

Lingual membrane long and narrow. Teeth about 35-1-35. Centrals with a stout, short, median cusp, bearing a very short, blunt, cutting point, the outer cusps subobsolete. Laterals like the centrals, but unsymmetrical. Marginals wide, low, with one, inner, short, broad, sharply bifurcated cutting point, and one shorter, outer, bifurcated cutting point. Pl. VI, fig. I.

The genital system (pl. VI, fig. VI) is peculiar in several respects. The ovary (11) is very slender, and equals about one-half the length of the oviduct. The epididymis (2) is highly developed, greatly convoluted, stout, four times the length of the ovary. The oviduct (8) is convoluted.

The prostate (4) is greatly developed. The penis sac (5) is short, cylindrical, entering the vagina near its base, and receiving both vas deferens (7) and retractor muscle (6) at its apex. The genital bladder (9) is small, oval, with a short duct (16) entering the vagina about the middle of its length. The vas deferens (7) is swollen on leaving the prostate. Testicle not observed.

The marginal teeth of the lingual membrane are more of the type of *Triodopsis* than *Mesodon*, as known to us at present. I am in doubt, therefore, of the subgeneric position of the species.

***Helix Wheatleyi*, Bland. (*Mesodon*.)**

Hayesville, N. C., Miss Annie E. Law.

Jaw as usual in the subgenus, with about twelve ribs.

Lingual membrane long. Teeth about 67-1-67. Centrals and laterals as described under *H. Clarki*. Marginals high, narrow, with one very long cutting point to the single cusp. Outer marginals about as high as wide, with one long inner, obtusely pointed, cutting point, and one shorter, outer cutting point.

The first marginal teeth resemble those of *H. thyroides* in the single, greatly produced cutting point. The extreme marginals, however, are bifid.

The genital system in the specimens received was too decayed to allow of complete examination. The penis, however, was in perfect condition. It forms the peculiar feature of the system on account of its enormous development. It is short, cylindrical, with blunt ends, very stout, three or four times as large as the oviduct, with retractor muscle, and vas deferens at its apex.

***Helix Pennsylvanica*, Green. (*Mesodon*.)**

The upper portions of the genital system (pl. V, fig. VII) not observed. The penis sac (5) is long and slender, with the vas deferens (7) and retractor muscle (6) entering its apex, and its orifice entering the vagina near its base. The genital bladder (9) is long, stout, cylindrical, with a median contraction; its duct (16) is hardly distinct from it, with an entrance opposite that of the penis sac. The prostate (4) is very large.

***Helix clausa*, Say. (*Mesodon*.)**

Ohio.

Pl. V, fig. iv. The penis sac (5) is the conspicuous feature of the system: it is longer than the oviduct, and almost as stout, of about equal size throughout; it has the entrance of the vas deferens (7) and retractor muscle (6) at its blunt apex. The genital bladder (9) is small, lengthened oval, with a long, slender duct (16). The prostate (4) is narrow, stout, prominent, cord like. The vas deferens (7) is large. The other organs present no peculiar features.

***Helix Traski*, Newc. (*Arionta*.)**

Specimens from the mouth of San Tomas River, Lower California, collected by Mr. Henry Hemphill.

The genital system resembles very nearly that which I have figured of *Helix Nickliniana*, Lea (Proc. Phila. Acad. Nat. Sci. 1874, 41, pl. iv. fig. III). The duct of the genital bladder in this species is, however, very much longer, its accessory duct shorter in proportion, the flagellum of the penis sac longer. There is also a peculiar feature in the genitalia of *H. Traski*, a globular organ of about equal diameter with the vaginal prostate, attached laterally to the flagellum of the latter, before it becomes bifurcated. The bulbous expansions on the two branches of the flagellum are also much larger in *H. Traski*. It is figured in pl. VI, fig. IV.

***Helix Stearnsiana*, Gabb. (*Arionta*?)**

To the kindness of Mr. Henry Hemphill I am indebted for living specimens of this species from Todos Santos Island and the mouth of the San Tomas River, Lower California. The result of the examination of the genitalia and lingual dentition establishes its specific distinction from the Catalina Island form (*H. Kelletti*, Forbes) to which it is nearly related by the characters of its shell. (See L. and F. W. Shells N. A., I, 176, 177).

The genitalia (pl. VI, fig. II) resemble very nearly those of *H. Kelletti* (Proc. Phila. Acad. Nat. Sci. 1874, pl. iii, fig. 4, p. 39).

A comparison of the figures, however, will show considerable difference, especially in the dart sac (14). In the species before me there is a long thread like duct (14^d) leading from the base of the dart sac (14) to a large globular organ, whose character is unknown to me. Opposite the entrance of this duct a corresponding duct (14^e) branches out, but instead of ending in a globular organ it becomes much enlarged in size and ends in enveloping the prepuce (12). The dart sac (14) contained a small dart of the form figured by Leidy (Terr. Moll. U. S., I) for *Tebenophorus Caroliniensis*.

The oviduct was closely and spirally wound around the duct of the genital bladder. The testicle (1) and ovary (11) are yellow.

The jaw is thick, arched, ends blunt, but little attenuated; anterior surface with six stout, separated ribs denticulating either margin, and several less developed, interstitial ribs.

The lingual membrane is long and narrow with about 50-1-50 teeth. The centrals are of the form of those of *H. Californiensis* (L. and F. W. Shells N. A., I, fig. 297). The cusp with its cutting point, however, is

very much shorter, reaching only about half-way to the lower edge of the base of attachment. Laterals of same type. Marginals low, wide, very variable in the denticles, but usually with one long, broad, sharply bifid inner denticle (the inner point much the smaller), and one short sharp, rarely bifid outer denticle.

The Catalina Island *H. Kelletti* has same type of dentition. The marginals, however, seem much more broadly denticulated.

Strophia iostoma, Pfr.

Inagua, Bahamas.

Jaw strongly arched, ends but little attenuated, bluntly rounded. Anterior surface without ribs. Cutting edge with a decided, blunt, median projection.

Lingual membrane (pl. II, fig. viii) long and narrow. Teeth about 29-1-29. Centrals but little longer than broad, tricuspid, the middle cusp short and stout, with a short, bluntly rounded cutting point; side cusps slightly produced, with a short, sharp point. Lateral teeth like the centrals but bicuspid. Marginal teeth a simple modification of the laterals, with one short, bluntly pointed inner cusp, and one still shorter, bluntly pointed outer cusp. Fig. *a* represents the central and lateral teeth, *b* a marginal tooth, *c* an extreme marginal.

Geomalacus maculosus, Allm.

England. Mr. J. Gwyn Jeffreys.

The genital system is figured on pl. V, fig. x. For a description of it and of the jaw and dentition, see Ann. Lyc. Nat. Hist. N. Y., X, 308. As there stated, the vas deferens is conspicuous by its great length, and the penis sac has attached to its apex a singular globular organ, which is a conspicuous feature of the system.

Pallifera Wetherbyi, n. sp.

From near the mouth of Laurel River, Whitley Co., Kentucky, Mr. A. G. Wetherby collected many specimens of what appeared to be a small species of *Tebennophorus*. It was readily distinguished from the numerous young of *T. Caroliniensis* found in the vicinity by the arrangement of the blotches of color, they being in irregular, interrupted, transverse bands, instead of running longitudinally as in that species. The anterior portion of the body seemed also to be more swollen, and the posterior extremity to taper more rapidly than in *Caroliniensis*. On examining the jaw

I found it to be ribbed, a character placing the slug in the genus *Pallifera*. The presence of ribs was verified in four individuals. Small specimens of *T. Caroliniensis* from the same locality had the usual ribless jaw of *Tebennophorus*. It appears, therefore, that the slug must be considered a new species of *Pallifera*.^{*} It may be called after its discoverer. It is difficult to draw more satisfactory specific characters from specimens preserved in alcohol. One of them in its contracted state measures 12 millimetres in length.

Jaw (pl. II, fig. 1) arcuate, ends blunt, but little attenuated; anterior surface with decided, separated, unequal ribs, denticulating either margin, about 15 on one specimen, those at the ends being less developed than on the balance of the jaw; cutting edge with a decided, short, blunt, median projection.

Lingual membrane (pl. II, fig. 11) long and narrow. Teeth about 35-1-35. Centrals long, expanding towards the base, cusp stout, with a stout blunt cutting point not reaching the lower margin of the base of attachment, side cusps obsolete. Laterals same as centrals, but unsymmetrical. Marginals (*b*) low, wide, with one inner, long, oblique, blunt cusp, and one outer, short, usually bluntly bifid cusp.

***Bulimus foveolatus*, Rve. (*Orphnus*.)**

Northern Peru. Prof. Orton.

This and the other species collected by Prof. Orton were determined by Mr. Bland.

Jaw slightly arched, wide, low, thin, with over 50 delicate ribs of the kind herewith described under *Bulimulus Lobbi*: ends but slightly attenuated, blunt.

Lingual membrane (pl. I, fig. III) long and narrow, composed of very numerous rows of about 34-1-34 teeth each. Teeth as usual in the *Helicidae*. The centrals (*a*) with one short cusp, the side cusps being obsolete, cutting point short, bluntly pointed. Laterals like the centrals, but unsymmetrical, and with a more developed outer side cusp. Marginals *b*, a simple modification of the laterals, smaller, higher than wide, with the cutting point longer. The plate gives one central with its adjacent lateral, *a*, and three extreme marginals, *b*.

The membrane is very thick and strong, and of equal width throughout its length, the ends being bluntly truncated.

^{*} Its dentition is more related to *Tebennophorus* than to *Pallifera* by the absence of side cusps and cutting points to the central and lateral teeth.

The genus *Bulimus* seems to be characterized by marginal teeth to its lingual membrane of the same type as the laterals, being simply a modification of the latter. Thus far we know the dentition of the following species: *B. porphyrostomus*, *scarabus*, *odontostomus*, *glaber*, *auris-sileni*, *multicolor*, *egregius*, *oblongus*, *ovatus*, *magnificus*, *Hanleyi*, *marmoratus*, and *aulacostylus*. *B. auris-sciuri* (which appears to be a var. of *B. glaber*), figured by Guppy and Hogg, may not agree with these, but the figure is too bad to judge from.

***Bulimus auris-sileni*, Born. (*Pelecychilus*.)**

St. Vincent.

For description of jaw and lingual dentition, see Ann. Lyc. Nat. Hist. N. Y., X, 222. For figure of latter, see Proc. Phila. Acad. Nat. Sci. 1874, pl. vi, fig. 4.

The genitalia are figured at natural size as they appear suspended in water. The whole system is very long and slender. The testicle (1) is embedded in the upper lobe of the liver; it is composed of long cæca. The epididymis (2) is convoluted along the half nearer the oviduct. The accessory gland (3) is composed of prominent aciniform cæca. The ovary (11) is short and stout, much broader than the oviduct, lobulated. The oviduct (8) is long, narrow, greatly convoluted. The vagina is long, very narrow. The external orifice is behind the right eyepeduncle. The penis sac (5) is the most prominent organ. It is extremely long, exceeding the length of the whole system. It is tubular, of about equal length along three-fourths of its course, where it receives the vas deferens (6) and commences to taper gradually towards the apex, merging into a long, delicate flagellum or lengthened retractor muscle, said muscle being attached to the end. The penis sac does not appear actually to enter the vagina; the two organs terminating side by side.

The genital bladder (9) is small, globular, its duct (16) is almost as long as the oviduct, of very unequal breadth. For two-fifths of its length beyond the bladder it is delicate, then rapidly expands into a tube as wide as the ovary, then, tapering, becomes again narrow at the commencement of the last fifth of its course, but again widely expands before entering the vagina at the upper third of the length of the latter organ. Pl. IV, fig. v.

***Bulimus glaber*, Gmel. (*Pelecychilus*.)**

Island of Grenada.

Jaw as in *Bulimulus*, *Cylindrella*, etc.

Lingual membrane long and narrow. Teeth as usual in the *Helicinae*, long and narrow, centrals tricuspid, laterals bicuspid, marginals a simple

modification of the laterals, with one large, long, inner, pointed cusp, and two outer, small points. See Proc. Phil. Acad. Nat. Sc., 1874, pl. vi, fig. 6.

Cylindrella sanguinea, Pfr.

Jamaica.

The genital system (pl. II, fig. vii), as would be inferred from the shape of the shell, is very much lengthened in all its organs. The testicle (1) is in a globular mass lying close to the oviduct. The epididymis (2) is short. The oviduct (8) is very long and narrow. The vagina is two-thirds the length of the oviduct, it is narrow, with a bulbous expansion at the insertion of the duct of the genital bladder, above its centre. The genital bladder (9) is very small, globular, on a very narrow, long duct (16), which expands at its entrance into the vagina. The penis sac (5) is short, thick as the oviduct, bluntly terminating above, where the vas deferens (7) and retractor muscle (6) are inserted. The ovary (11) is short and stout.

Cylindrella brevis, Pfr.

Jamaica.

The genitalia have the same arrangement as in *C. sanguinea*, herewith described. The duct of the genital bladder (16) in this species is much more expanded before it enters the vagina, and the latter organ below the junction is expanded to a greater size than the oviduct. The penis sac (5) is shorter and stouter in *brevis* than in *sanguinea*. Pl. II, fig. iii.

Bulimulus Altoperuvianus, Rve. (*Drymæus*.)

Between Balsas and Cajamarca, Peru, Prof. Orton.

Genitalia (pl. I, fig. ix) of the same general form as I have herewith described for those of *Bulimulus Lobbi*. The ovary (11) is smaller in proportion, the oviduct (8) more developed. The duct of the genital bladder (16) enters lower down upon the vagina. The testicle (1) is farther removed from the ovary, lying in the apex of the shell. It is composed of short, stout, blunt cæca. The ovary is of a dark slate color, the rest of the genital system is white. The external orifice is behind the right eye peduncle. The edges of the ovary are very deeply scalloped.

The jaw has thirty-one ribs. It is of same type as that herewith described of *Bul. Lobbi*. Lingual membrane (pl. I, fig. iv) of same type as herewith described and figured for *Bul. Lobbi* as far as centrals and laterals (*a*) are concerned. The marginal teeth, however, are quite different from those of that species. They are quite like the laterals, excepting that the cutting point is very much more produced, and somewhat curved towards the central line of the membrane.

These peculiar marginal teeth remind one of those of *Helix Ghiesbreghtii* as figured by Messrs. Fischer and Crosse. In that species, however, the notch is on the outer, not the inner, side of the cutting point.

It will be noticed that the cutting point on the central tooth of *B. Altoperuvianus* is more produced than in *B. Lobbi*, to which I have compared the dentition.

Bulimulus Peruvianus, Brug. (*Plectostylus*.)

Talcahuana, Peru. Museum of Comparative Zoology, Cambridge.

Jaw and lingual dentition already described by me. (Proc. Ac. Nat. Sc. Phila., 1874, 53, pl. V, fig. 2.)

The genital system is figured on pl. I, fig. viii. The testicle (1) is extremely large, apparently composed of aciniform cæca. The epididymis (2) is long, very thick, and greatly convoluted in its whole course. The ovary (11) is long and slender. The oviduct (8) is long and narrow. The vagina is short. The short duct (16) of the genital bladder (9) enters at its upper end. The genital bladder is very stout, almost as thick as the oviduct, tapering above gradually to a long flagellate point. The penis sac (5) enters the vagina near its lower end. It is smaller than the genital bladder, cylindrical, tapering gradually towards the apex, where it has a flagellate appendix, into the end of which, perhaps, is inserted the retractor muscle. The vas deferens enters the penis sac at its upper end. The external orifice of the generative organs is behind the right eyepeduncle.

Bulimulus Lobbi, Rve. (*Drymaeus*.)

Between Balsas and Cajamarca. Prof. Orton.

The genital system is quite similar to that which I have figured of *B. Altoperuvianus* (pl. I, fig. ii), the ovary (11), however, is much larger than in that species. The testicle (1) is composed of short, blunt cæca; it lies near the ovary. The epididymis (2) is short. The accessory gland (3) is composed of several long, threadlike cæca. The ovary is long, equalling one-third of the oviduct, and twice as broad. The oviduct (8) is long, convoluted, narrow, with deeply scalloped edges. The vagina is short, tubular, receiving the duct of the genital bladder near its top, and the opening of the penis sac just above its base; between the two there is a short decided expansion of the vagina. The penis sac (5) is long and slender, with a long, flagellate extension, on the end of which the retractor muscle (6) is attached. The vas deferens (7) enters the penis sac at about the middle of its length. The genital bladder (9) is small, globular, on a delicate duct (16) equalling in length the vagina and oviduct combined. The external orifice of generation is behind the right eyepeduncle.

The jaw (pl. I, fig. vi) is arcuate, with attenuated, blunt ends, thin, transparent, of the same type as is common to *Bulimulus*, *Cylindrella*, *Amphibulima*, *Gæotis*, etc., i. e., with narrow, distant ribs, running ob-

liquely towards the median line, so that those of the centre converge before reaching the bottom of the plate. These ribs serrate the upper and lower margins. They increase in thickness gradually on their outer edge. There are twenty-one ribs on the specimen examined. The material of the jaw is so thin on the outer edge of the ribs that it separates into distinct plates at these points, when macerated. In some specimens examined the ribs appear to be formed by an actual overlapping of distinct plates. I have no doubt, however, of the jaw being in one single piece, divided by these delicate ribs into numerous plate-like compartments. It is not composite as formerly believed by most authors.

The lingual membrane (pl. I, fig. 1) is broad, very delicate in texture and difficult to handle. There are numerous rows of about 90-1-90 teeth each. The centrals have a base of attachment longer than wide, with lower lateral expansions. The reflection has one stout median cusp, the side cusps being obsolete; this cusp bears a short, rapidly attenuated, sharp cutting point, not reaching the lower margin of the base of attachment. The laterals are of same type as centrals, but unsymmetrical, the cutting point, however, is very different from that of the centrals, being very broad, bluntly rounded at its end, oblique, extending far below the base of attachment, and having on its inner margin, near the blunt end, a prominent blunt notch. The marginals are a modification of the laterals, but lower, with a much more oblique cusp, bearing a much broader trifid cutting point, the middle division very much more produced than the outer ones.

The figures represent *a* one central with its adjacent lateral teeth, and *b*, two marginal teeth.

The lateral teeth are a modification of the usual *Helicinae* type not before observed by me. The marginal teeth are somewhat like those seen in many species of *Bulimulus*, such as *laticinctus*, *Bahamensis*, *auris-leporis*, *papyraceus*, *Jonasi*, *membranaceus*. They only approach, however, the teeth of those species in form.

***Bulimulus rhodolarynx*, Rve. (*Scutalus*.)**

Northern Peru. Prof. Orton.

The genital organs were so reduced as to be only threadlike, and not sufficiently developed to be described as perfect.

The jaw was not examined, being of so delicate texture as to be quite destroyed by the action of potash.

The lingual membrane is long, narrow. Teeth about 40-1-40, of the usual type of *Helicinae* (see pl. I, fig. v). The central teeth, *a*, have one median cusp, the outer cusps being obsolete, the cutting point is short and bluntly pointed. Lateral teeth same as centrals, unsymmetrical, the inner subobsolete cusp more developed. The marginals (*b*) are simple modifications of the laterals, subquadrate, bicuspid, each cusp with a long, oblique, stout cutting point.

From this description it will be seen that *Bulimulus rhodolarynx* has the type of dentition which appears normal to the *Helicinæ*, in this respect agreeing with *B. cinnamomeolineatus*, *pallidior*, *chrysalis*, *Guadalupensis*, *alternatus*, *sporadicus*, *dealbatus*, *solutus*, *sepulchralis*, *durus* and *Peruvianus*. For the species differing from the common type of *Helicinæ* dentition, see remarks under *B. Lobbi*.

***Bulimulus Proteus*, Brod. (*Scutalus*.)**

Northern Peru. Prof. Orton.

Genitalia quite like those described and figured of *Bul. Altoperuvianus* (pl. I, fig. II). All the organs were delicate, almost threadlike, and not so well developed as in the species to which I have compared them. Orifice behind right eyepeduncle.

Jaw, with 28 ribs, of same type as herewith described for *B. Lobbi*.

Lingual membrane of same type as *Bul. Altoperuvianus*, herewith described.

***Bulimulus primularis*, Rve. (*Mesembrinus*.)**

Northern Peru. Prof. Orton.

The genitalia are like those of *Bul. Proteus* herein described, but the ovary is orange colored.

The jaw was imperfect and thus the number of ribs cannot be given. It is of the same type, however, as herewith described of *Bul. Lobbi*.

The lingual membrane (pl. I, fig. vii) is broad. Central teeth of same type also as in *Bul. Lobbi*, but much shorter and stouter. The lateral teeth of *Bul. Lobbi* and *B. Altoperuvianus* are wanting in this species, their place being entirely filled by marginal teeth of the form known in *Bul. laticinctus* (see Ann. Lyc. N. H. of N. Y. x, pl. i). The teeth are subquadrate, with a very large, curved, obliquely trifid cutting point, extending far below the lower margin of the base of attachment.

Fig. *a* gives one central tooth with the two adjacent marginals; fig. *b* an extreme marginal. The latter will be seen to be rather narrower than those nearer the median line of the membrane.

***Orthalicus obductus*, Shuttl.**

Islands in Bay of Panama, Mr. McNiel.

Jaw as usual in the genus. Lingual membrane (pl. VI, fig. III) as usual in the genus. Teeth about 96-196. The side spurs to the cusps (rep-

representing the side cusps of the usual *Helicinae* type) are not present on the first laterals, but are conspicuous on those farther removed, as shown in figure *b* of the seventh lateral tooth.

***Orthalicus gallina-sultana*, Chemn.**

Marañon, Peru. Prof. Orton.

An opportunity having been given me by the kindness of my friend, Mr. Thomas Bland, of examining the animal of *Orthalicus gallina-sultana*, Chemn., I here give descriptions of its genital system and lingual dentition. It will be seen that my figures of the latter do not agree with those published by Troschel (Arch. für Nat., 1849, pl. iv, fig. 3), at least so far as centrals and laterals are concerned, these teeth not being represented in Troschel's plate. It must be borne in mind, however, that at that early date, the membranes were not so carefully studied as at present, and consequently the peculiarity of these teeth may have been overlooked by Troschel. Of the identity of the specimen examined by me, there can be no doubt.

The jaw (pl. IV, fig. E) is of the type usual in *Orthalicus* and *Liguus*, but up to the present time never observed in any other genus. It is composite, its separate plates being apparently soldered firmly at their upper portions, where, indeed, they seem collectively to form a jaw in a single piece as in *Helix*, etc., but at their lower portion positively detached and free, imbricated one upon another. The jaw may in one sense be said to be in a single piece, as argued recently by Messrs. Fischer and Crosse, (Moll. Mex. et Guat.), but with equal correctness it may surely be said to be composite, as the amalgamation of the upper portion is produced by the joining of absolutely separate pieces. There are fifteen of these plates, the three upper central ones apparently lying upon the fourth, which is very broad and extends from the upper to the lower margin of the jaw. The jaw is strongly arched, with attenuated, blunt ends. There are well marked perpendicular grooves upon the anterior surface of many of the plates.

The lingual membrane (pl. IV, fig. A-C) is very broad (13 mill.), for its length (16 mill.). The rows of teeth are arranged in a backward curve from the median line for a short distance, and then run obliquely to the outer margin of the membrane. The central teeth have a long and rather narrow base of attachment, squarely truncated at the top, incurved with slight lateral expansions at the base. The reflected portion bears one stout, median cusp, the side cusps being subobsolete. This cusp bears a

long, stout, lance-like cutting point, extending below the base of attachment to a sharp point, and bearing at the centre of its length on each side a prominent, subobsolete, blunt spur. There are three lateral teeth of the same type as the centrals, but made unsymmetrical by the suppression of the inner lower lateral expansion to the base of attachment, and the inner subobsolete lateral spur to the cutting point. The fourth tooth from the central tooth changes suddenly into a marginal tooth of the form common in *Orthalicus*, i.e., a long, stout, subquadrate base of attachment with fringed lower margin, bearing at its lower portion, a broad, bluntly rounded subobsolete cusp, from which springs a short, widely expanded, broad, bluntly rounded, gouge shaped cutting point, which has a small, outer, lateral spur of the same bluntly rounded form. This form of marginal teeth runs quite to the edge of the membrane, those nearer the outer edge being smaller, more widely separated, and in more oblique and more widely separated rows.

Fig. A gives a central tooth with adjacent teeth to the fifth tooth on one side, and only one lateral on the other side; fig. C gives the eighth tooth; fig. D two extreme marginals; fig. B an extreme marginal in profile.

The count of the teeth in one transverse row is over 108-1108.

Peculiar as this form of dentition seems, it has already been noticed in *Liguus virgineus*. (See Am. Journ. Conch., VI, 209, fig. 3, 4, and below pl. III). That species differs widely, however, in the lesser size of its membrane ($10 \times 4\frac{1}{2}$ mill.), the smaller count of the teeth, 40-140, and in having but two well marked laterals. That species also has several teeth intermediate between the laterals and marginals which vary greatly on different parts of the membrane.

This form of dentition is very instructive in showing the modification of the type usual to the *Helicinae*. The central teeth may be said to be obsoletely tricuspid, and the side spurs to the greatly produced cutting point are but a modification of the usual cutting points on the side cusps of the *Helicinae*. The lateral teeth are in the same way but a modification of the usual bicuspid laterals of the *Helicinae*. The marginal teeth are more abnormal in form, but they still are but modified from the laterals by the expansion, bluntly rounding and shortening of the cusps, and by the still greater expansion, shortening and bluntly rounding of the cutting points. In *Orthalicus iostomus*, *melanochilus*, *undatus* and *Liguus fasciatus*, this process of suppressing the usually decided cusps and cutting points is extended equally to the central and lateral teeth. Other species show the same aber-

rant form of centrals and laterals, as *Bulimulus aurisleporis*, (Mal. Blatt., XV, pl. v, fig. 8). In less degree are the laterals modified from the usual *Helicinæ* type in *Simpulopsis sulculosa* (ib. fig. 10) as to the cutting points, and in the same particular in *Bulimus Peruvianus* (Proc. Ac. Nat. Sc. Phila., 1874, pl. v, fig. 2). No doubt future research will bring to light a complete series of teeth in land shells, showing a gradual modification in different directions of the normal tricuspid and bicuspid type.

There seem no peculiar characters to the respiratory, digestive and nervous system of the animal. The genitalia are figured on plate IV, fig. F. The external orifice is behind the right eyepeduncle. The testicle (1) is as usual in the *Helicinæ* embedded in the lobe of the liver occupying the extreme apex of the spire of the shell; it is composed of fasciculi of short, stout, blunt cæca. The epididymis (2) is short, convoluted as usual. The accessory gland (3) is on a short threadlike peduncle. The ovary (11) is very large, tongue shaped, lobulated above and decidedly spongelike in its division on its concave side. The oviduct (8) is long, narrow, convoluted. The genital bladder (9) is large and oval, on a long duct (16) which in its natural position is adherent to the oviduct in its entire length: it is much larger in its lower third, equalling the stout vagina, near whose middle it enters; below this point the vagina becomes very stout. The penis is cylindrical, about as long as the vagina, tapering rather abruptly to its apex, where is inserted a long, delicate, retractor muscle (6), which resembles a flagellum. The vas deferens (7) enters the penis on its side, near its summit. There are no accessory organs. The penis (5) does not appear to enter a common duct of male and female organs, but to have a separate opening of its own.

The general arrangement of the genitalia is like that of *O. undatus*, (see this paper), *O. longus* and *iostomus* (Fischer and Crosse), *Liguus fasciatus* (Leidy), and *L. virgineus*, see below. The last four, however, have a single multifid vesicle, which I failed to detect in *O. gallina-sultana*; and from them all there is ample specific difference in the size of the ovary, the shape and size of the penis sac, and the size of the duct of the genital bladder, near its base.

It may fairly be assumed that no generic difference exists between the genitalia of *Orthalicus* and *Liguus*.

These remarks are suggested by the treatment of *Liguus fasciatus* by Messrs. Fischer and Crosse (Moll. Mex. et Guat.). On account of the resemblance in dentition to the species of *Orthalicus* known to them rather than to the

allied *Liguus virgineus*, these authors place *Liguus fasciatus* in *Orthalicus*, under the subgeneric name of *Orthalicinus*. The same reasoning will now oblige them to place *Orthalicus gallina-sultana* in the genus *Liguus*, for its dentition resembles that of *L. virgineus* and not that of the other known species of *Orthalicus*. It appears to me much better to wait till more is known of the dentition of *Orthalicus*, before we consider the teeth as reliable generic characters.

***Orthalicus undatus*, Brug.**

It will be interesting in connection with my comparison of *Orthalicus* and *Liguus* to state that having had an opportunity of dissecting six specimens of this species, from Jamaica, I found the genitalia constantly agreeing with Lehmann's fig. in Malak., Blatt., 1864, pl. i, fig. 4. There is no multifid vesicle on the penis as in the species of *Orthalicus* figured by Fischer and Crosse (Moll. Mex.). With this exception, the genitalia are quite like those figured by Leidy for *Liguus fasciatus* (Terr. Moll. U. S. I. pl. v).

It will be seen above that *Orthalicus gallina-sultana* is also characterized by the want of the multifid vesicle.

***Liguus virgineus*, Lin.**

Aux Cayes, Haiti. Mr. Robert Swift.

In connection with my friend, Mr. Thomas Bland, I have already described the jaw (L. and F. W. Shells N. A., I, p. 312, fig. 364) and lingual membrane (Am. Journ. Conch. VI, 209, figs. 3, 4) of this species. The membrane having become still more interesting from its resemblance in some respects to that of *Orthalicus gallina-sultana*, Chemn., lately examined, I have given the accompanying more detailed illustrations (pl. III).

There is, it appears, considerable variation in the development of the cutting points of the central and lateral teeth, and the cusps of the first marginals, on different parts of the membrane. Fig. D is taken from the most perfect portion of the membrane, the most anterior portion. Fig.

13. The vaginal prostate.
- 13a. flagellum to same.
- 13b. accessory gland to same.
- 13c. accessory duct to same.
- 13d. same as last with globular organ.
14. The dart sac.
15. The flagellum.
16. The duct of the genital bladder.

In the figures of dentition it will be understood that the general intention is to give (*a*) one central tooth with its adjoining lateral, and (*b*) one or two marginal teeth. The numbers of the teeth refer to their position in counting from the median line of the membrane. This arrangement gives as good an idea of the characters of the dentition as my space will allow.

PLATE I.

FIG.

- I. *Bulimulus Lobbi*, Rve. Dentition; *a*, lateral teeth: *b*, extreme marginal teeth.
- II. *Bulimulus Altoperuvianus*, Rve. Genitalia.
- III. *Bulimus foveolatus*, Rve. *a*, central and lateral teeth: *b*, extreme marginals.
- IV. Dentition of II. *b*, extreme marginals.
- V. *Bulimulus rhodolarynx*, Rve. *b*, marginals—first and extreme.
- VI. Jaw of I.
- VII. *Bulimulus primularis*, Rve. *b*, extreme marginal tooth.
- VIII. *Bulimulus Peruvianus*, Brug.

PLATE II.

FIG.

- I. *Pallifera Wetherbyi*. Jaw.
- II. Same; dentition. *a*, central and lateral teeth: *b*, marginal teeth.
- III. *Cylindrella brevis*, Pfr. Genitalia.
- IV. *Zonites sculptilis*, Bland. Dentition; *b*, extreme marginals.
- V. *Bulimus auris-sileni*, Born. Genitalia.
- VI. *Helix nucleola*, Rang. Genitalia.
- VII. *Cylindrella sanguinea*, Pfr. Genitalia.
- VIII. *Strophia iostoma*, Pfr. Dentition; *a*, central and lateral teeth: *b*, marginal tooth: *c*, extreme marginal tooth.
- IX. *Helix discolor*, Fér. Genitalia.

PLATE III.

FIG.

- Lingual dentition of *Liguus virgineus*, Lin.
- A. From the least developed end of the membrane. The central tooth with the two lateral teeth and three marginal teeth.
 - B. From near the centre of the membrane.
 - C. From near the anterior end of the membrane; portions of two adjacent rows of teeth.
 - D. From still nearer the anterior end of the membrane.
 - E. Marginals from the same end of the membrane as the last.
 - F. Extreme marginal in profile.
 - G. Extreme marginals.

PLATE IV.

FIG.

- A. Lingual dentition of *Orthalicus gallina-sultana*, Chemn.
- B. A marginal tooth of the same in profile.
- C. The same. The eighth from the median line.
- D. The same. Extreme marginal teeth.
- E. The same. Jaw.
- F. The same. Genitalia.
- G. *Liguus virgineus*, Lin. The genitalia.

PLATE V.

FIG.

Genitalia and Dentition of

- I. *Zonites inornatus*, Say.
- II. *Zonites friabilis*.
- III. *Helix Troostiana*, Lea.
- IV. *Helix clausa*, Say.
- V. *Helix rufo-apicata*, Poey.
- VI. Dentition of III.
- VII. *Helix Pennsylvanica*, Green.
- VIII. *Helix nuxdenticulata*, Chemn.
- IX. *Helix Josephinae*, Fér.
- X. *Geomalacus maculosus*, Allm.

PLATE VI.

FIG.

- I. *Helix Clarki* Lea. Lingual dentition, *a*, central and lateral tooth; *b*, marginal tooth. See also fig. v for extreme marginals.
- II. *Helix Stearnsiana*, Gabb. Genitalia.
- III. *Orthalicus obductus*, Shuttl. Lingual dentition; *a*, central and lateral teeth; *b*, the seventh tooth; *c*, extreme marginal teeth.
- IV. *Helix Traski*, Lea. A portion of the genital system, showing vaginal prostate.
- V. See I.
- VI. Same as I. Genitalia.
- VII. *Helix Wetherbyi*; Bland. Lingual dentition; *a*, central and lateral teeth *b*, first marginal teeth; *c*, extreme marginal teeth.

Note on the Jaw of PARTULA.

Having lately received through the kindness of Dr. W. D. Hartmann a number of *Partula* preserved in alcohol, I am preparing a description of their lingual dentition, genitalia and jaw. The latter is the most important point to be studied, this organ never having been described, I now, therefore, give the following particulars:

In *P. fusca*, Pease, *umbilicata*, Pease and *virginea*, Pease, it is very thin and transparent; arcuate with attenuated ends; cutting margin with a broad very slight median prominence; anterior surface with numerous (over 60 in *virginea*) very delicate, separated ribs, slightly denticulating

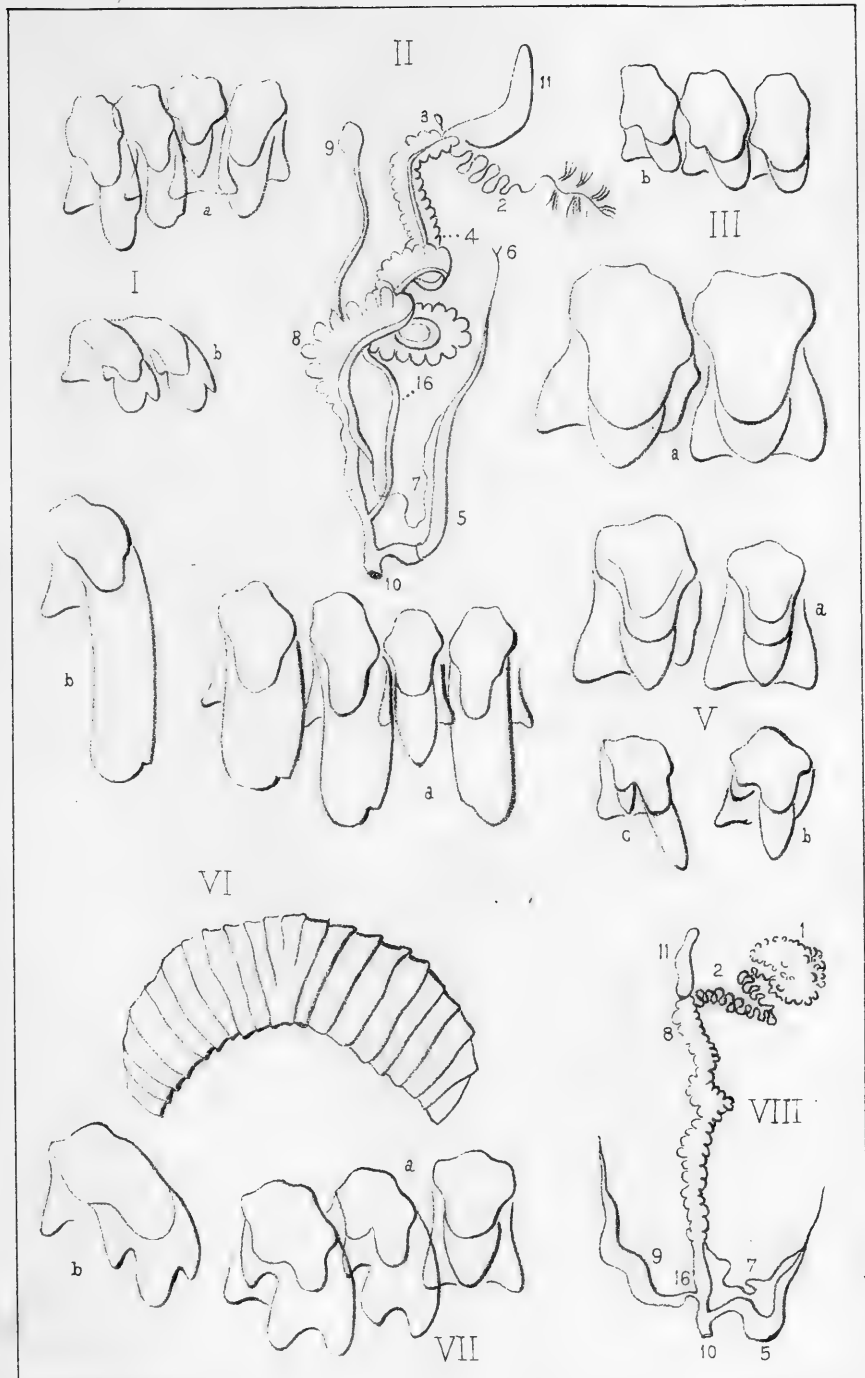
either margin, those of the centre converging and meeting before reaching the lower margin, as in *Cylindrella*, &c. The jaw appears therefore to be of the same type as in *Bulimulus*, *Gæotis*, *Amphibulima*, *Cylindrella*, *Macroceramus* and *Pineria*. The ribs, however, are in *Partula* exceedingly fine.

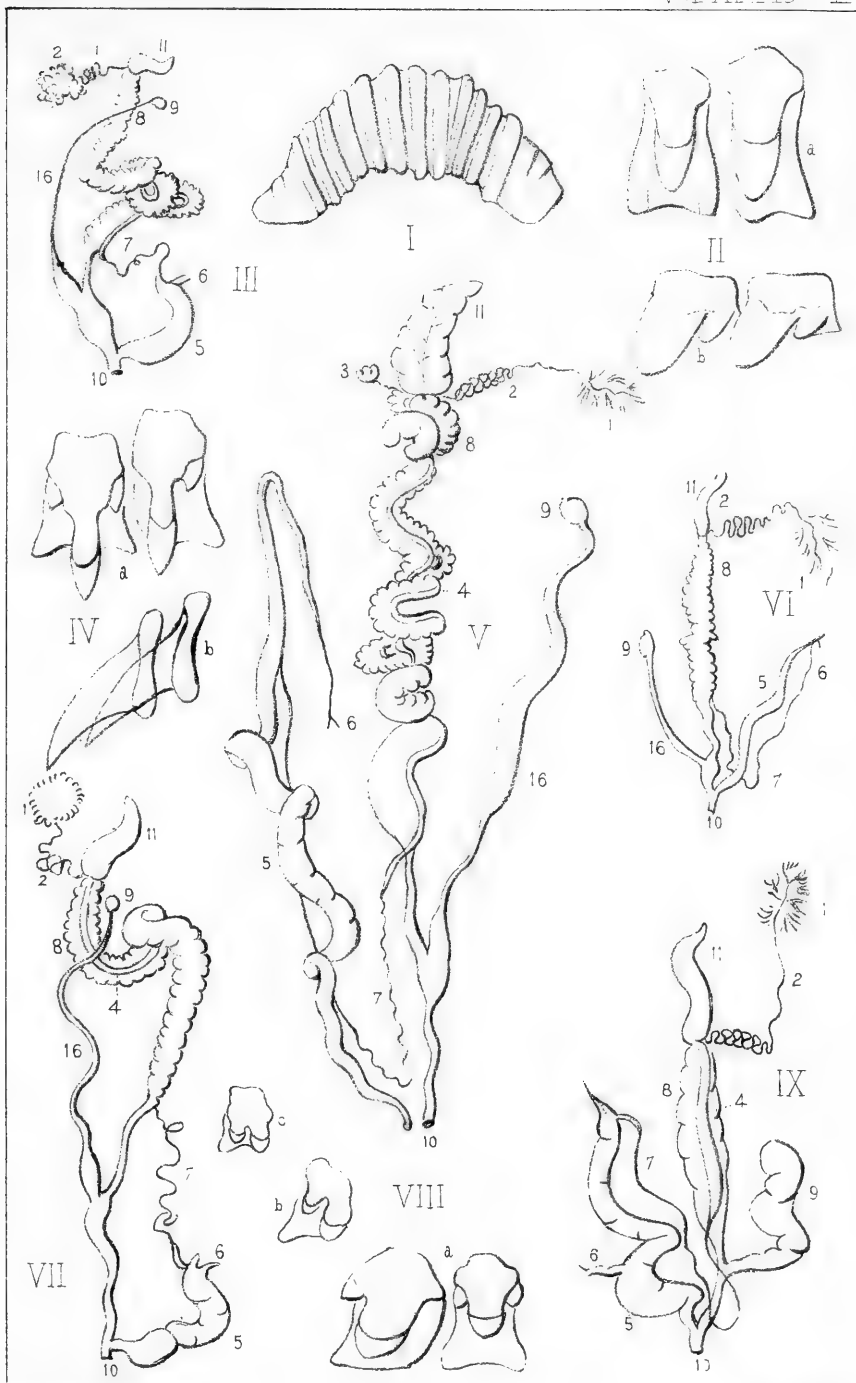
The lingual dentition of the species mentioned above is the same as figured by Heynemann (Mall. Blatt. 1867, pl. i, fig. 1,) excepting that I detect distinct cutting points to the side cusps of the central teeth, not figured by him.

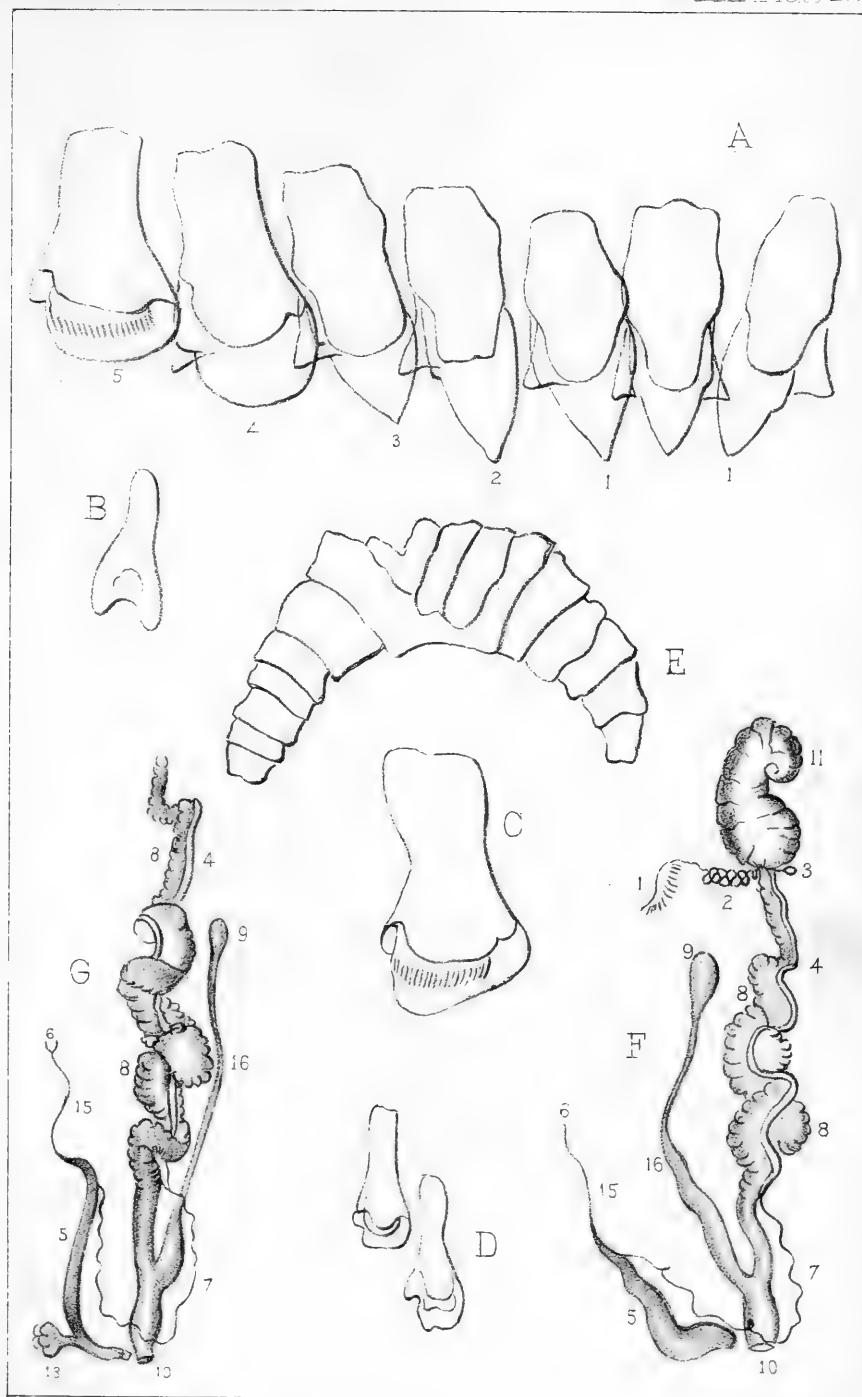
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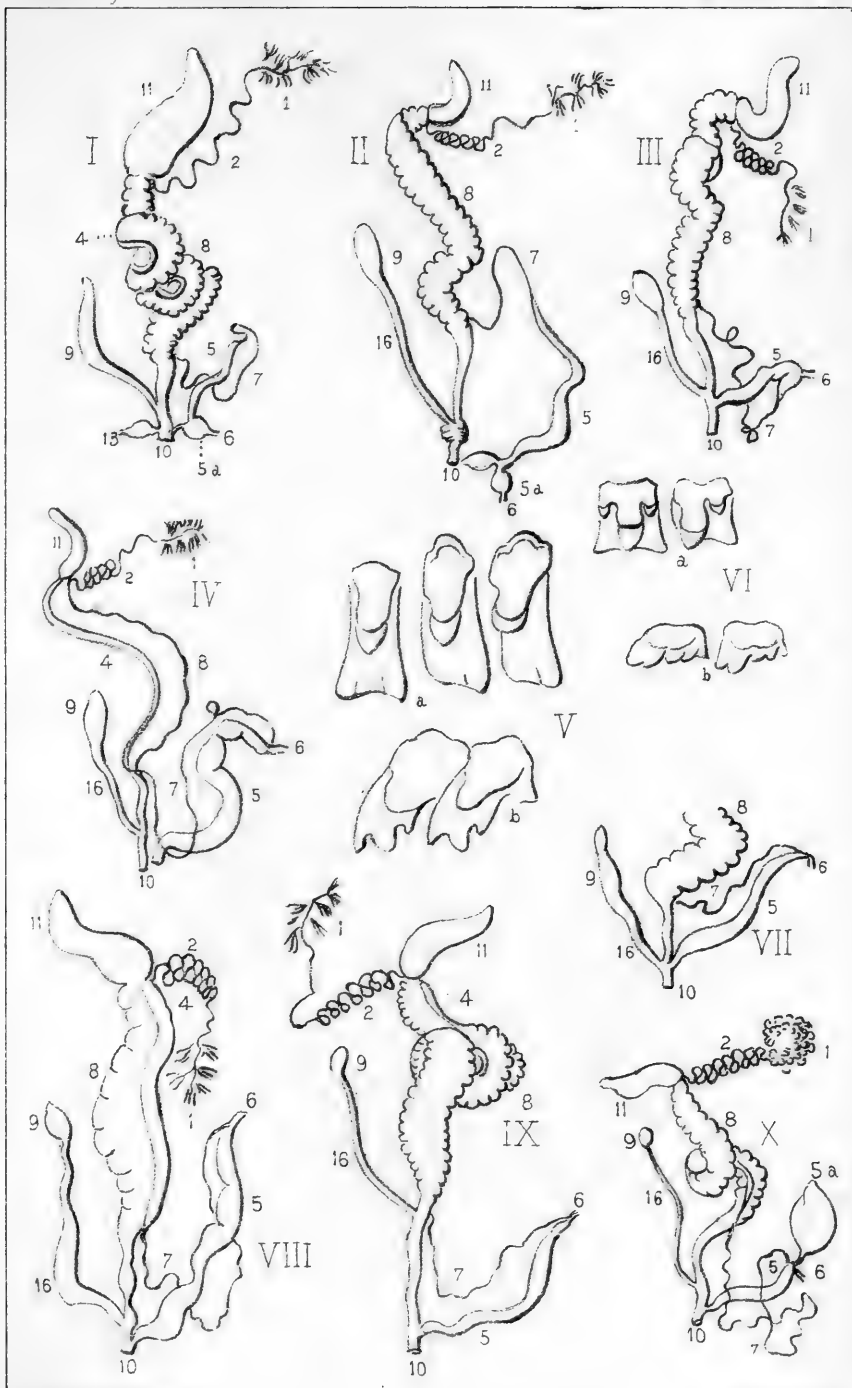


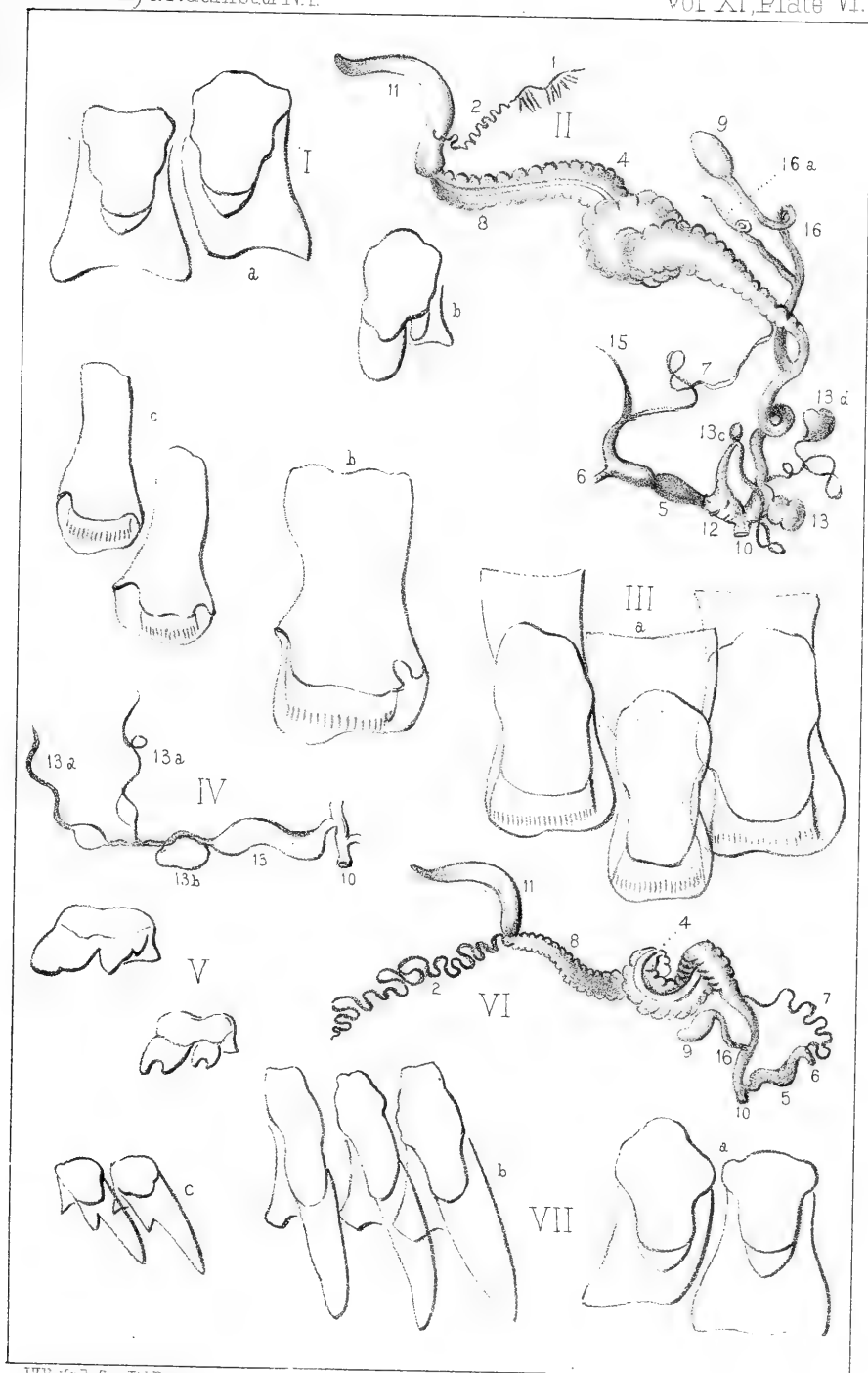


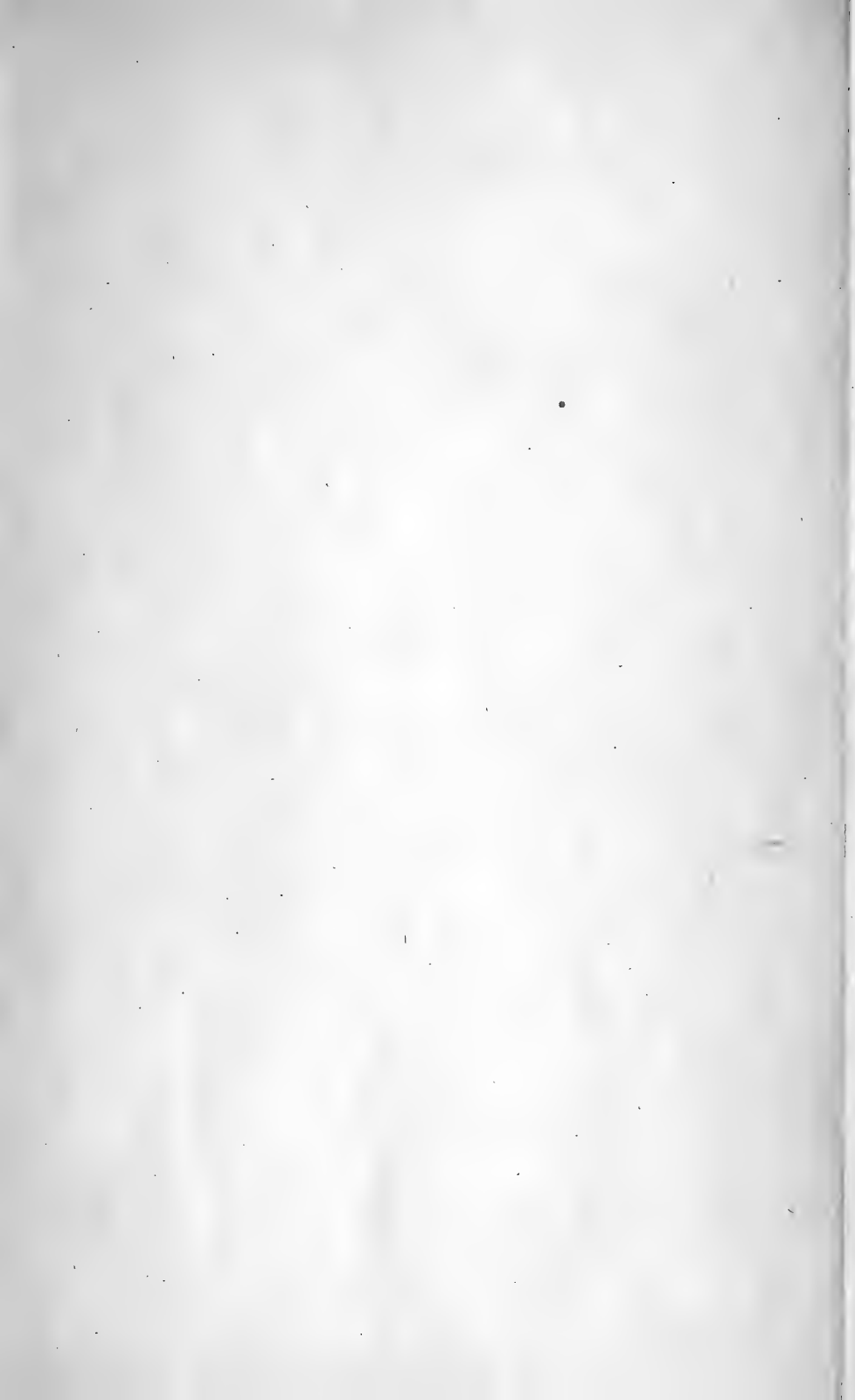


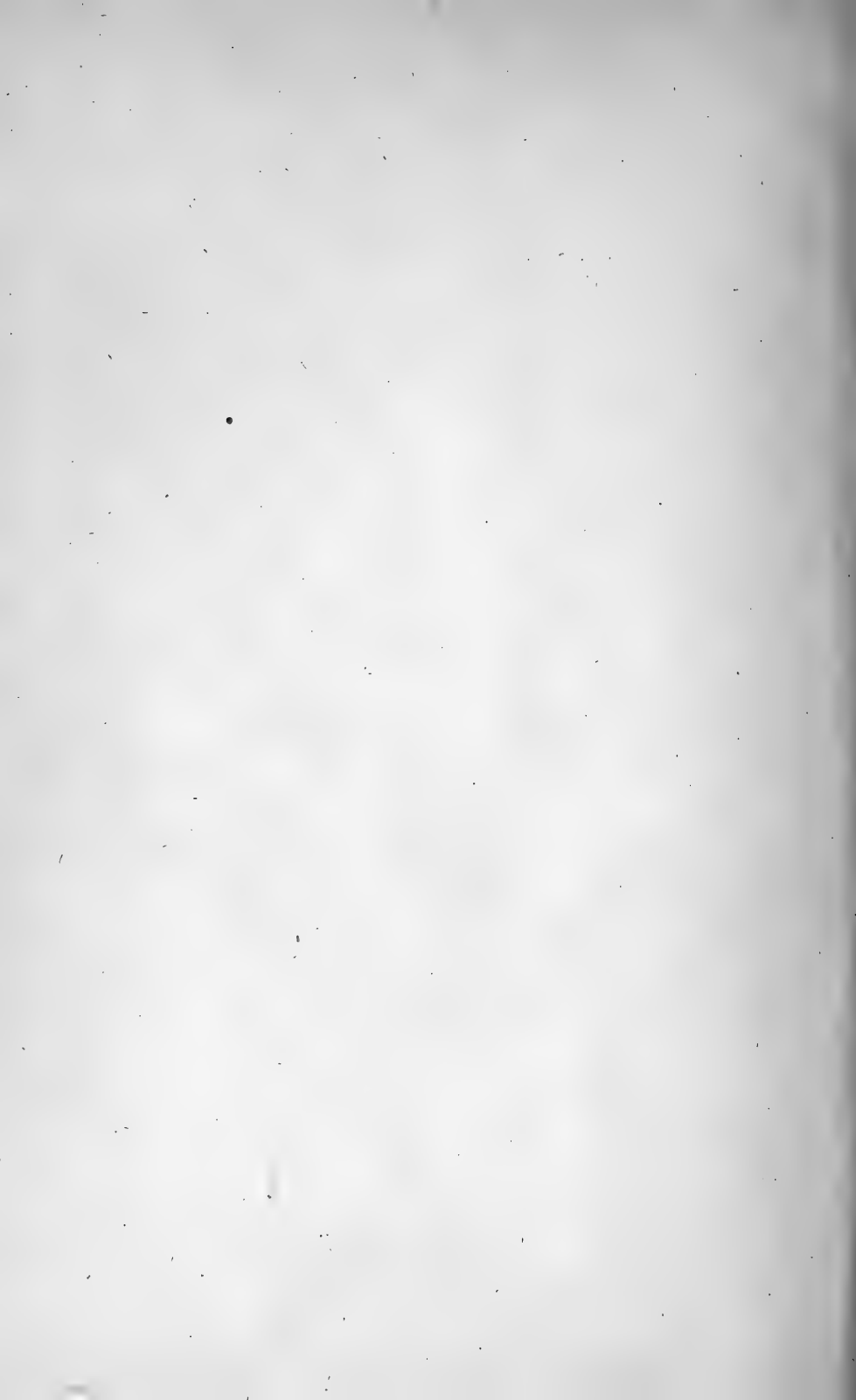


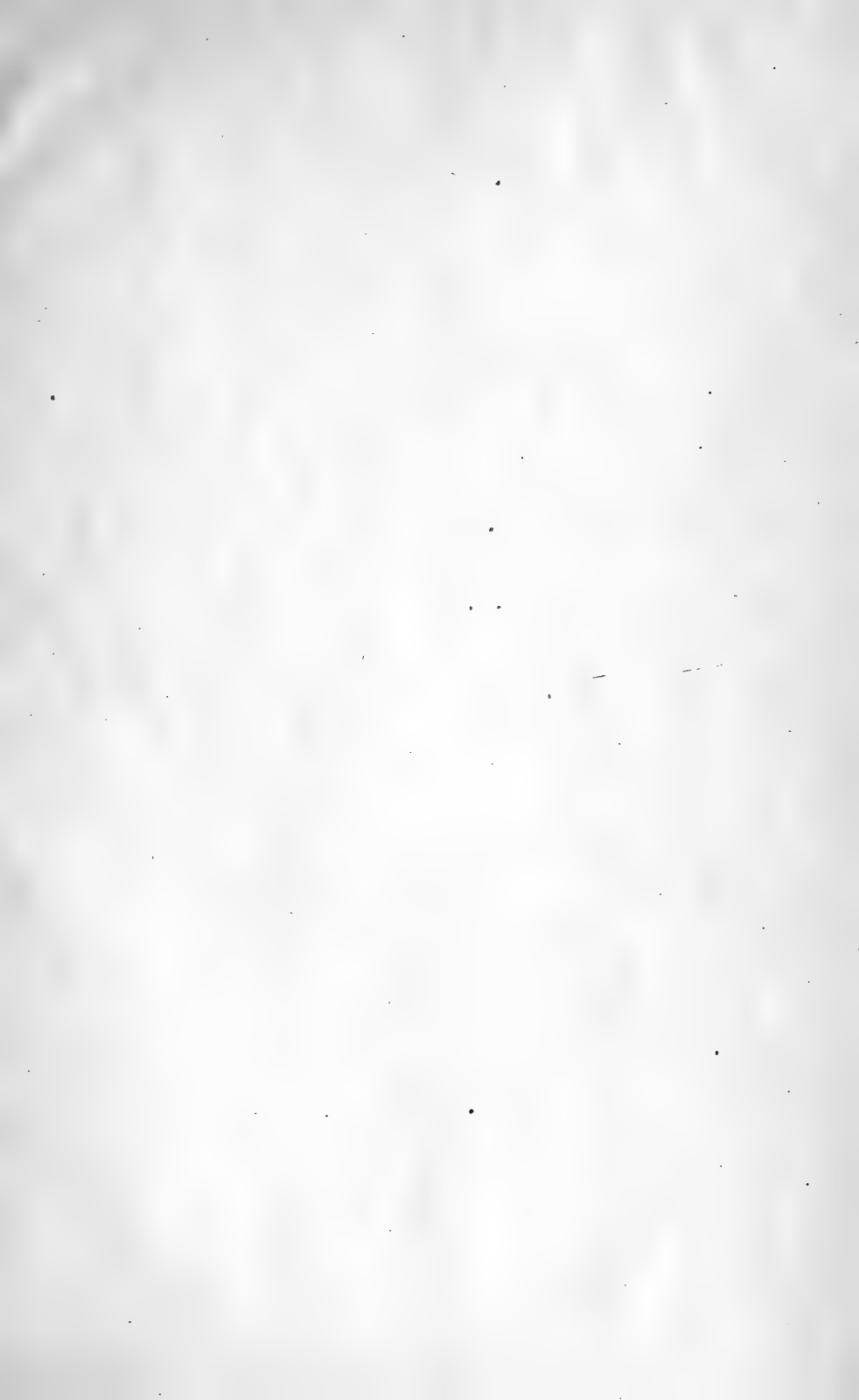


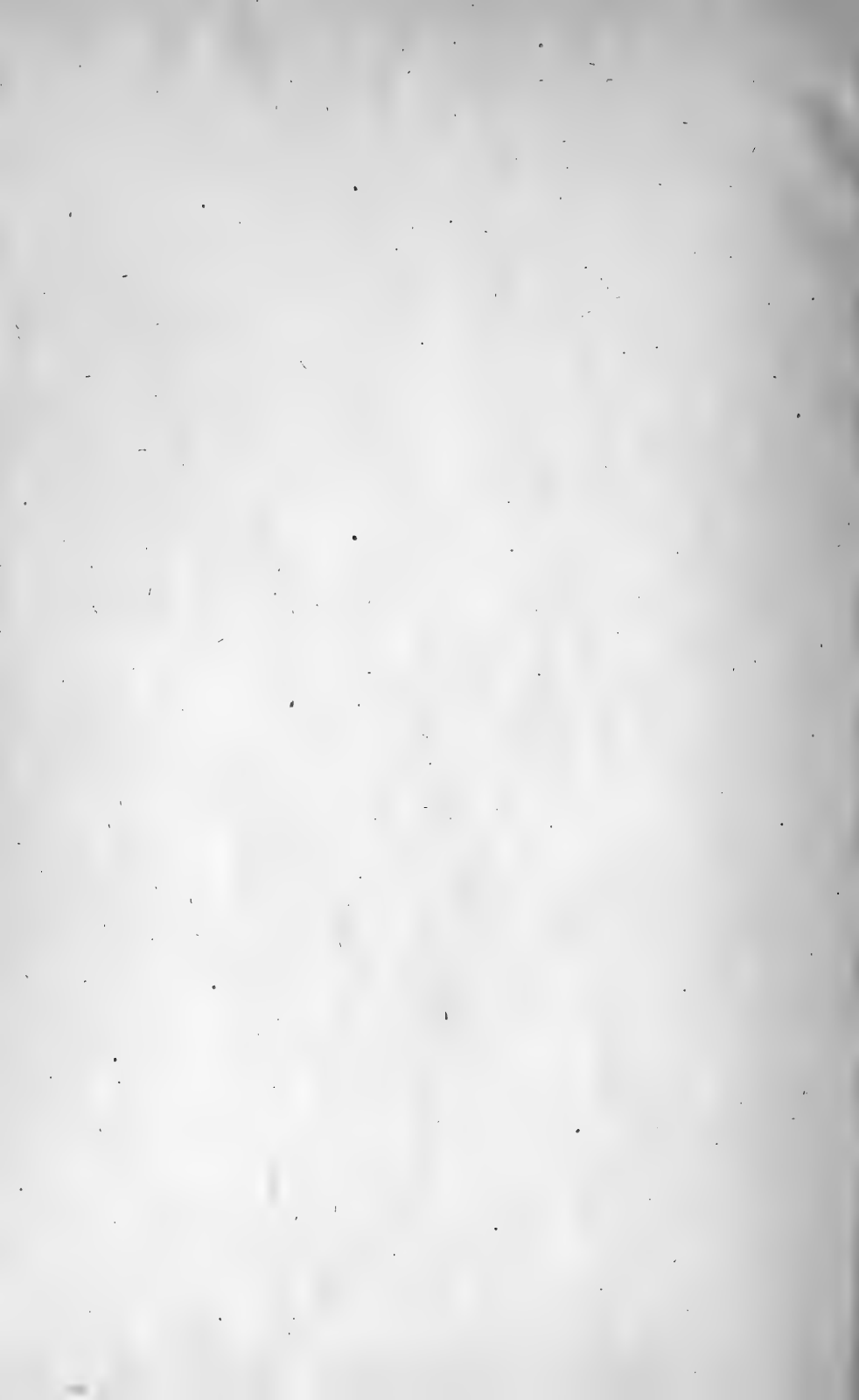














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